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ISSN 0725—4115 NZ $3.50
REGISTERED BY AUSTRALIA POST PUBLICATIONS VBP 3691

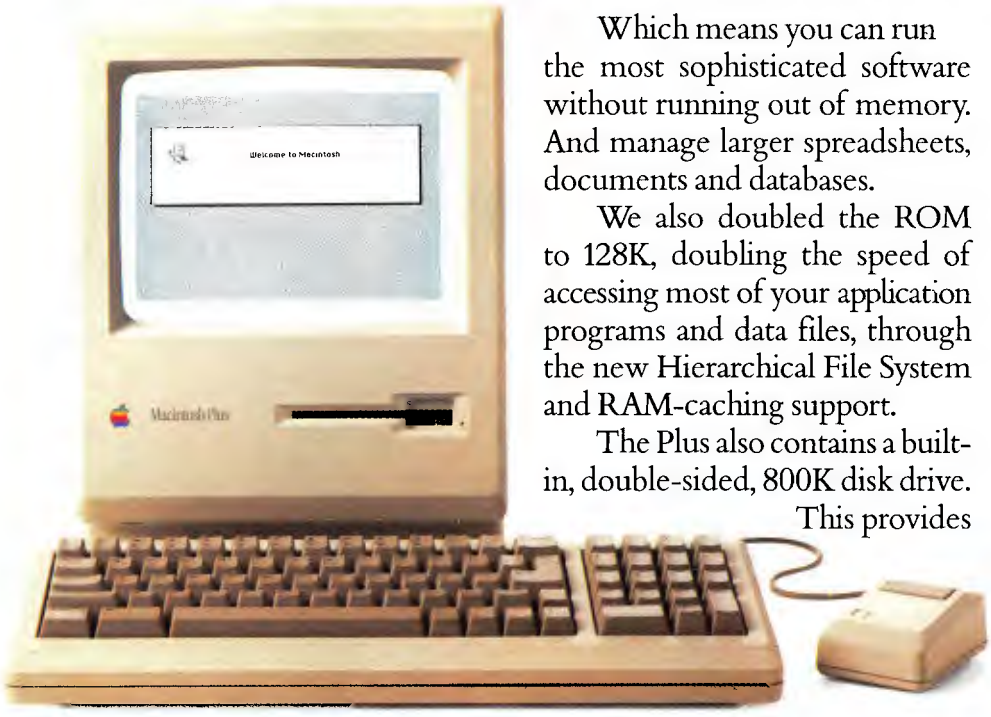
MAY 1986 $3.50

AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE

ATARI'S MEGABYTE MASTERPIECE?

The new 1040ST reviewed

New Macintosh Plus. We've added



This year Apple introduces a new Macintosh.

Macintosh Plus.

As the name suggests, it's evolutionary, rather than revolutionary

(It's not our policy to bring out totally new computers for the sake of it. Instead we strive to perfect existing ones.)

Macintosh Plus is as simple to learn and use as before.

But there are some big differences, encouraged, we don't mind admitting, by current Macintosh owners.

Some of you asked for more power, others speed. Some needed greater storage capacity, others expandability.

Some heavy number-crunchers wanted a numeric key pad and conventional cursor keys built into the keyboard rather than remote.

Done. Done. And done.

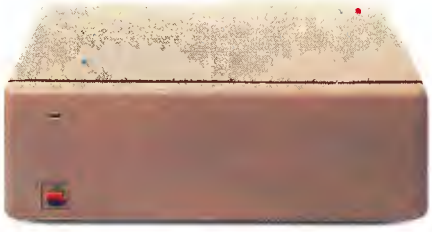
The pluses of this new Macintosh include a full megabyte of RAM (expandable to four megabytes).

Which means you can run the most sophisticated software without running out of memory. And manage larger spreadsheets, documents and databases.

We also doubled the ROM to 128K, doubling the speed of accessing most of your application programs and data files, through the new Hierarchical File System and RAM-caching support.

The Plus also contains a built-in, double-sided, 800K disk drive. This provides twice the capacity of the previous Macintosh and the equivalent of 400 typed pages, or a bulging file drawer.

If that's still not enough, you can always plug in another 800K external drive.



Or you can really go all out and add our new Hard Disk 20.

(Its 20 megabytes are about 10,000 pages worth.)

Just plug in a Macintosh Hard Disk 20 and you can keep all your software, files, worksheets and documents within a moment's notice of your screen.

Add the Apple program Switcher, and you can actually work with several applications at once, moving information from one into another with the greatest of ease.

So you can transfer notes from an outline to a report – or numbers from a data file to a spreadsheet – as fast as you can click your mouse.

AppleCare.

All Apple products come with an automatic 3-month warranty covering all parts and labour.

But this year, Apple introduced a sort of "Warranty Plus" through the AppleCare service programme.

If you fill out and mail to us the registration form enclosed with your equipment, you will receive nine extra months' cover on top of the normal three.

Macintosh Plus also features a new SCSI connection port (dubbed "Scuzzy" in typical fashion by the development team).

SCSI stands for Small Computer Systems Interface and it's an industry standard.

We've virtually opened up the architecture. But what we've really done, of course, is open up a whole new world of possibilities.

The Scuzzy port let's you daisy-chain up to seven high-performance (and often low-priced) peripherals like hard disks, file servers and tape backups from all sorts of third parties.

Given all this power, it made sense to team it with equally impressive printers.

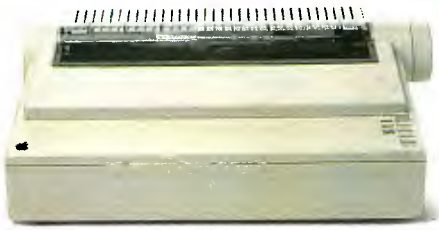
The new LaserWriter Plus is just such, producing documents with text and graphics of publishing quality.

everything except complications.

And it maintains this fidelity on copy paper, letterhead, labels, envelopes or overhead transparencies.

LaserWriter Plus has 35 different typefaces built in, a choice that would embarrass your local printer (and his invoices).

But if you don't need publication-quality printing, you can have near letter-quality by teaming up your Macintosh with the ImageWriter II.



It prints in three different modes: high-quality, standard and draft. And churns it out at speeds of up to 2½ pages per minute.

You can feed in single sheets automatically with the optional SheetFeeder.

And print up to seven colours using appropriate software.

ImageWriter II can also be shared with other Macintosh users via AppleTalk.

But this Macintosh isn't called Plus for nothing. You can just add and add.

Items like an AppleTalk Personal Network.

It's the most flexible, low-cost, easy-to-set-up, easy-to-use network around.

It'll connect up an office full of Macintoshes, LaserWriters, ImageWriters and file and disk servers – 32 devices in all.

Using an electronic mail package, you can send messages to any Macintosh screen on the network.

Or with EtherMac software you can share information with other computers. (Our computer is so friendly it'll even talk to IBMs.)

Add an Apple Modem 1200 to your Macintosh and you can talk to anyone virtually anywhere.

With a communications program like MacTerminal, a standard telephone and an Apple modem, your Macintosh can plug into electronic information services like Viatel, Minerva and Midas and communicate with mainframes and minicomputers.

If you already own a Macintosh, there's another plus.

You can upgrade your machine to the new one megabyte. Ask your dealer for upgrade details.

You can also upgrade your LaserWriter to become a LaserWriter Plus.

Get hands-on with the new Macintosh Plus.

You should like it.

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If you wish to own a Macintosh system, you can take advantage of the Apple Credit Card, available from participating dealers.

You can use it to purchase computers, peripheral equipment and software with no down-payment and less impact on your cash flow.

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For an authorised Apple dealer near you outside Sydney, you call toll-free (008) 22 1555 or Sydney 908 9088. AP 219/Palace

Apple

APC

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Editorial *Managing Editor* Sean Howard; *Assistant Editor* Mario Bokic; *Consultant Editors* Steve Withers, Ian Davies. **Advertising** *Advertising Manager* Mark Reiss; *NSW and Qld Sales Manager* Gerard Kohne. *NSW and Qld Sales Executive* John Nuutinen (02) 264 1266, *Vic, SA, WA and Tas Sales Manager* Jenny Gold (03) 531 8411. **Production** Graphic Heart Pty Ltd. **Distribution** *Subscriptions Manager* Judy Welsh (02) 264 1266; *Subscription rates* Australia $35 per annum, overseas A$47.00 (surface) A$130 (airmail); *Newstand sales* Network Distribution Co. 54 Park Street, Sydney 2000.
Publishers Computer Publications Pty Ltd (a subsidiary of Consolidated Press (Holdings) Ltd).
Sydney Office: 215 Clarence Street, Sydney 2000; telephone (02) 264 1266; telex AA 20514 CONPRES. **Melbourne Office:** 77 Glenhuntly Road, Elwood 3184, telephone (03) 531 8411; telex AA 30333 'AMJ'.
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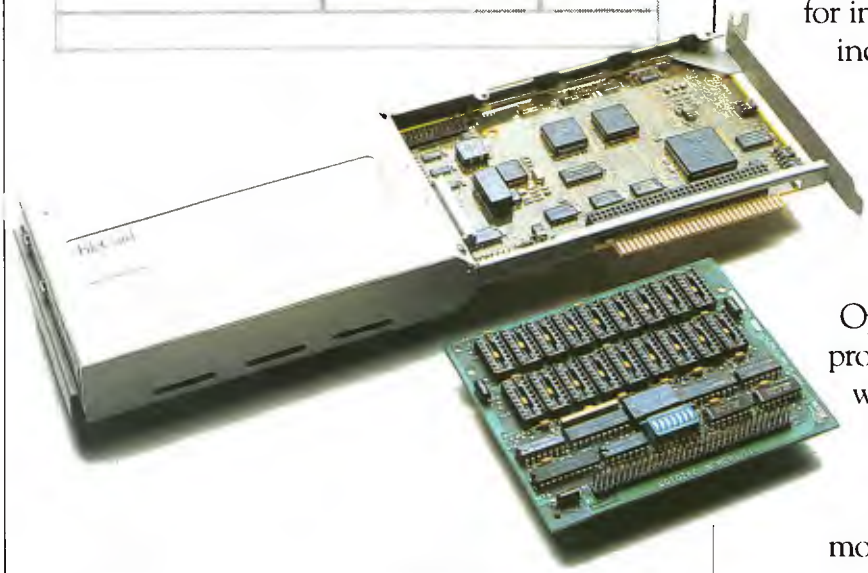
Robin Mudge explains how PCs can be put to good use in short-wave radio listening. *See page 50.*

NOWHERE UP FRONT FOR A HARD DISK?



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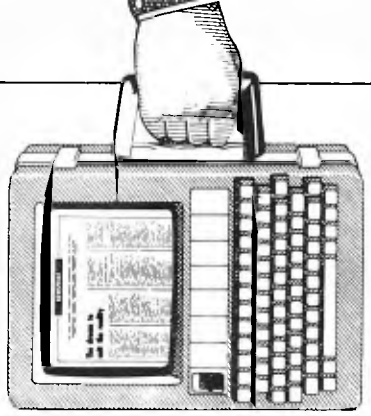

All the news that's fit to print from APC's world-wide network of reporters.

Excelling yourself

People at Microsoft may boast that the company's new version of Multiplan (a spreadsheet) 'will become the favourite among businesses which require fast, powerful number-crunching facilities,' but I doubt that they believe it.

On the other hand, Microsoft does have a very powerful spreadsheet available on the Macintosh, Excel. And the signs are that this combination of hardware and software is being seen by buyers, as a step forward in the spreadsheet world.

Reports from Apple aren't really an objective guide, any more than the opinions of Microsoft. However, after Mac sales took a noticeable dip in the machine's second year, they are now reported to be encouragingly better — and no-one can see any real reason, other than Excel.

I'm not a spreadsheet user. My opinions on the power, ease and facilities of one spreadsheet over another are not to be taken as informed comment. Having made that disclaimer, I was fascinated to watch a colleague, with equally little experience of spreadsheets, take Excel, and use it to produce a really neat set of pie charts to illustrate an article — all in an hour or so of getting the software from Microsoft.

The comparison with Lotus is interesting. Users who have tried both assure me that Excel is quicker, easier, and does more things. And, on a 1Mbyte Mac Plus, Microsoft hopes, it will hold an enormous amount more of data.

If this really is the package that launches a million Macs, I'll have to smile. To me, spreadsheet use is a totally irrational human activity, indulged in by most people just because other people have spreadsheets which make their proposals look better. You have to have one to counter *their* proposals.

Surely, we can agree some strategic arms limitation laws on this corporate escalation of rivalry?

Guy Kewney

The currency of true concurrency

A fairly polite punch-up is being arranged on the subjects of windowing and multi-tasking — both subjects close to my heart.

In the ring will be Bill Gates, founder and head of Microsoft, taking the Windows corner, with Digital Research challenging from the Concurrent corner in the person of Paul Bailey.

Hopefully the two, in the company of other experts, will at last have a chance to explain what 'true multi-tasking' is, as opposed to — well, whatever the other sort is, depending on point of view.

Both have taken up powerfully fortified positions in the past, only to be found a year or so later, wandering around the walls with a party of elephants and trumpeters with high explosives, explaining the untenability of their former strongholds.

In the case of Gates, his theory was that you 'didn't need' true concurrency, and as long as you could switch context, with (perhaps) some background printing, that was it. Now, the gospel says, you need Windows, with (you guessed) 'True Concurrency'.

By contrast, Bailey sold Concurrent 286 on its 'True Concurrency' for years. Then DR got the Atari contract and put CP/M 68k (disguised as TOS) into the ST.

Unfortunately, that is not 'True Concurrency'; and suddenly, Bailey was found explaining that experience (the best teacher) made it clear that True Concurrency was Too Hard for the typical user.

Guy Kewney

The thin black strip you might just be able to make out below the space bar is 3M's 'First Touch' anti-static device. It works by grounding the operator, draining static electricity to below 500 volts within one second — the standard necessary to prevent damage or malfunction. The First Touch (sounds like a great name for a soft porn flick) sells for $55.

PC86 in Melbourne

It only seems like yesterday that the curtains were drawn at the last PC86 Show in Sydney. Now for all those people who couldn't make it, this is your chance to view PC86 — The Seventh *Australian Personal Computer* Show at the grand Royal Exhibition Buildings in Melbourne.

Coinciding with PC86 are two additional shows: Communications '86 and Office Technology '86.

The Seventh *APC* Show also has a further attraction — it is the chosen venue for the presentation of the '86 PC Awards. The PC Awards originated in 1985 to give recognition to quality and excellence in computer products manufactured or distributed in Australia.

International marketing consultant, and author of 'The Regis Touch', Regis McKenna will present the Awards at the opening function on June 2nd.

At the stands

The main attraction at the Sydney Show, without a doubt, was the Commodore Amiga. And I'm sure that Victoria will be just as bewitched watching the Amiga do its stuff.

According to Commodore's PR man, Ian Nicholas, 9000 orders (3000 of which were due to the Sydney Show), have been placed for the Amiga in only one week of trading.

Heed my advice and try to avoid the crowds. You'll save yourself a lot of bruising.

Commodore, now breathing easy thanks to a $150 million overdraft, will also feature the rest of its stock comprising the PC-10, PC-20, C128, the transportable C128D, as well as its home computer range.

Competing with the Amiga for attention will be the new Atari 1040ST, (see this issue's cover story). Atari's new Australian distributor, Mobex, will be exhibiting the 1040ST along with the rest of its range including the much talked about 520ST.

Big business

International Business Machines will be displaying its range of computers — PC, AT, XT and the JX. IBM in the US recently announced the PC Convertible. At this stage IBM Australia refuses to comment on 'if and when' the PC Convertible will cross to our shores.

I don't mean to dangle a carrot . . . but for those of you who haven't heard, Big Blue's latest weighs in at around 6kg, has 256k RAM, up to two 720k 3½in disk drives and a 78 key keyboard.

The LCD, according to IBM, uses a special bonding process which reduces the glare and reading difficulty usually associated with standard LCDs.

Apple Australia, no doubt, will be displaying the Macintosh Plus with its 1Mb RAM (expandable to 4Mb), numeric keypad . . . I know, we've heard and seen it all before. The good news from Apple is that people who have bought a 512k Macintosh since the Macintosh Plus was released (January 1986), will receive a free upgrade which includes an 800k drive and a new keyboard with numeric and cursor keypad. This machine is now known as the Macintosh 512/800.

Other Apple products on display will be its Desktop Publishing package with the all 'bells and whistles', LaserWriter Plus, Pagemaker and more.

Olivetti will be exhibiting its 'souped-up' version of the M24 — the M24SP. And the latest addition to the Olivetti family, the M22 (to be released in July), will also be on display.

Saunter over to the Hewlett-Packard stand and there you'll see the Vectra, the Portable Plus, Touchscreen Max, the transportable Integral as well as the ThinkJet and LaserJet printers.

Barson Computers will be exhibiting its Apricot Xen and the BBC range of computers plus its latest range of PCs (released in April), the Tandon PCA and PCX.

The PCA IBM AT-compatibles come in three configurations: a dual floppy drive system (PCX), or two hard

THE INNOVATORS

The judges of the Dick Smith Electronics Australian Personal Computer Innovation 86 competition have awarded the Class I category for a 'ready to run' product to James Woolley from the Queensland Institute of Technology. He proposed and wrote a program to allow the direct input of 3D objects' co-ordinates into a PC and to simultaneously display the object on the screen in isometric projection (or perspective, axonometric, or other projection) while storing the real world co-ordinates of the object in memory. The package is designed for use in a wide variety of industries including engineering, architecture and industrial design.

Courtesy of the competition's co-sponsor, James will receive an Olivetti M24 with a 20Mb hard disk system valued at $6795. Our thanks to Olivetti for providing such a magnificent incentive to the competition; APC was very pleased to offer what is generally considered one of the best, if not the best, PC-compatible on the market.

James' entry was of such a standard that, coming from an educational institution, he was also eligible for the Class III category — so the judges voted James the Class III winner too. Now he'll have $500 worth of software kindly contributed by Imagineering for his M24!

The Class II category was won by Sean Corr for his concept of an ultra-cheap computer-based keypad controller. It's suitable for push-button telephones, radios, industrial keypads and keypad operated radios (for which Sean has produced detailed construction plans and developed operational software). Sean will receive a Data Products 8012 dot matrix printer from Dick Smith Electronics.

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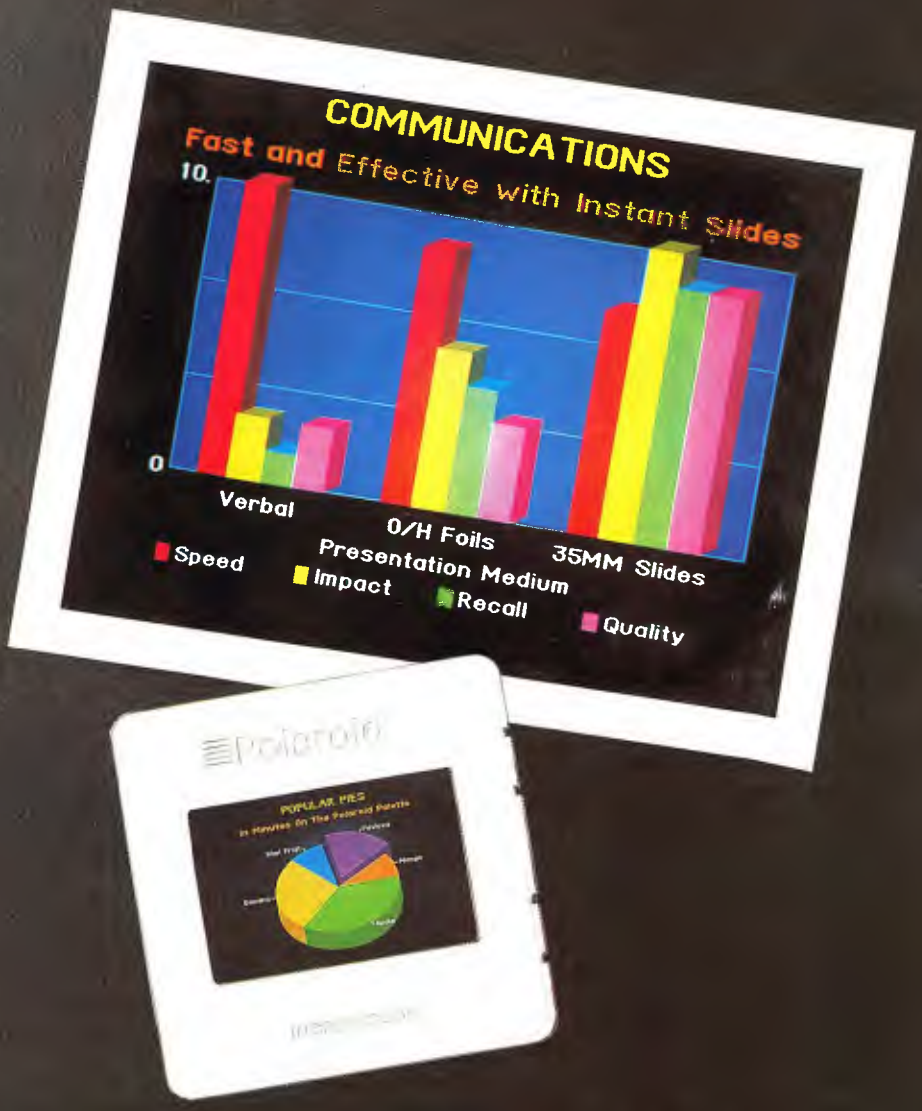

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disk systems, PCX-10 or PCX-20.

Our own Australian MicroBee Systems will be displaying its range of Premium Series which have colour facilities, built-in Viatel/Videotex communications and enhanced hi-res graphics.

MicroBee's latest entry is the Gamma featuring 32/16-bit technology based on the Motorola 68000 chip.

Peripherals & software

Arcom Pacific will be demonstrating Supercalc 3a (featuring integrated graphics and data management for the Apple IIc and IIe); SuperProject Plus; a fifth generation language development system, Turbo Prolog and a memory card which gives instant PC expansion up to 640k called Dr Zuckerboard.

Imagineering will be presenting a new product called Bluebird Board — a multi-user system for AT compatibles; MicroPro's latest WordStar 2000+ release 2; Paradox and the latest release of Lotus 1-2-3.

Microsoft will have people peering into its Windows, R-Base 5000, and its Macintosh range of software.

A new range of products from Symbiotic Computer Systems includes HyperDrive 2000, a high performance co-processor board and 20Mbytes hard disk for the Macintosh; HyperNet, a file server software package enabling users to link up to 32 Macintosh computers as part of an AppleTalk network; Laser Fonts, a series of eight down-loadable fonts for the Apple LaserWriter.

That just about covers our sneak preview, but don't think there are no surprises left — go out and have a look for yourself. And don't forget to pick up *APC* next month if you're a Victorian reader: it will be packaged with a free copy of the three-in-one Show Catalogue.

Maria Bokic

Atari in a deep sleep

The Atari 1040ST has been announced (See test this issue). It's cheap, big, fast and powerful. Cor!

The 'blitter' chip is due out this year. With that, Atari can hope to match the Commodore Amiga for speed on some graphics applications. And the machine that uses it will be available, with Unix, for under $3000, inside 12 months. Wow!

There will be a CD-ROM box for around $1200, later this year. And thousands of megabytes of data — just plug in and search. Blimey!

And a laser printer (slow, perhaps, at four pages a minute) for around $2500, is 'on the cards for availability before this time in 1987.' Coo!

Atari has — no doubt about it — wiped the nose of Commodore. On the face of it, the evidence is overwhelming.

The Amiga — where is it? And the Atari ST is taking over the world. There was an Atari Show a month ago which seemed terribly nostalgic to many who went to the first batch of Commodore shows of five years ago.

For a start, there was Jack Tramiel, quietly letting down his executives by saying the things he'd made *them* promise not to say, running the company — exactly like Commodore half a decade ago. There was his son, Sam, being one or two degrees too superior to talk to journalists (only this time, rather than being just one of Jack's two scapegrace sons, he's actually president of the company). And there was the team of nervous executives, wondering when the guillotine was going to fall and dump them onto the dole queue. And there was Robin Bradbeer, being a Friend Of Jack's and doing enormous megadeals.

But above all, there was the enthusiastic public, all falling over themselves to see the equipment, the software, the add-ons, the disks, the cables, the books, the demos, the special deals.

And yet, behind the scenes, although Atari has got it all right, and Commodore is nowhere to be seen, I found early signs of premature complacency.

The fact of the matter is that Atari got in front of Commodore for two reasons. Firstly, it didn't have a huge Tramiel-oriented and cumbersome organisation like Commodore has, a hangover from the days when Tramiel just had to be in control of everything. There is barely anyone at Atari, and *they* seem to do *everything*.

Secondly, Commodore has just announced that it has been saved from the threat of bankruptcy, by the arrangement of a $US150m overdraft. It has been labouring under the threat for at least five months, possibly longer, and has conspicuously failed to invest necessary funds in developing the Amiga as a result. No stand at Comdex, and no stand at CES, two of the most important shows on Earth for manufacturers.

However, Atari solved the problems that Commodore couldn't solve, not because it was rich, but because it ducked them. The machine wasn't quite ready, so they shipped incomplete STs. The software was in pre-Beta

Julian Barson has continued his tradition of association with Chuck Peddle (designer of the 6502 chip and the Pet, VIC and Sirius computers) by picking up the Australian distributorship of Tandon's PC-compatible range. Tandon is best known for its disk drives, which are used by a large number of manufacturers world-wide.

Tandon has produced machines which are compatible with IBM's PC, XT and AT. Prices start at $2910.

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AW 130

release versions, but they shipped it anyway. And when you opened the box, you found that things were supposedly included in the price (like Basic) weren't there. If you asked Atari why not, it just lied. Atari said it was there, honestly.

In the process, Atari made a lot of enemies among software writers.

Sig Hartman, Atari's head of software, yields place to no-one in his worship of Tramiel: even watching Jack fill his car with petrol, or fasten his shoes, is enough to make Hartman smile as if the sun had broken through the clouds. Yet Hartman felt obliged to apologise, and in quite fulsome tones, to assembled programmers from all over the world. 'We'll try to improve communications with you, he said, 'and we thank you for your patience.'

The problem has been bad for programmers.

On a related subject, Atari staff have decided (that is, Jack has told them) that they are now going to get back into the highly profitable video games cartridge business. They are going to sell 8-bit Ataris. And the ST business, obviously, is expected to be 'over the hump' (Sig Hartman said 'over the hill', but his English is a little confused at times) and, presumably, going downhill with the wind behind it.

Atari has to push new technology against expert old-world market-place machinery like Amstrad and it also has to tackle IBM. Complacency, with a machine stuck at 1Mbyte when the world is heading for the 16Mbyte machine, would be silly.

And to rely on Unix as a way to sell a personal computer, is plain silly. If we want progress, Atari has to wake up a little more than this.

Guy Kewney

Straight talk

"Don't let the announcements by Corvus and 3Com fool you; they may be offering versions of an AppleTalk file server, but these are not low-cost and they require at least part of a Macintosh's power to be dedicated to their control." — so begins a statement from Micro Peripherals announcing its file server for the AppleTalk network. The 'Keeper' is claimed to be the only file server to offer built-in intelligence to free all Macs on a network for other functions. Retail prices for the Keeper start from $4679 including a 10Mb hard disk.

Not unexpectedly...

Atari and Commodore have already begun price cutting on their new machines.

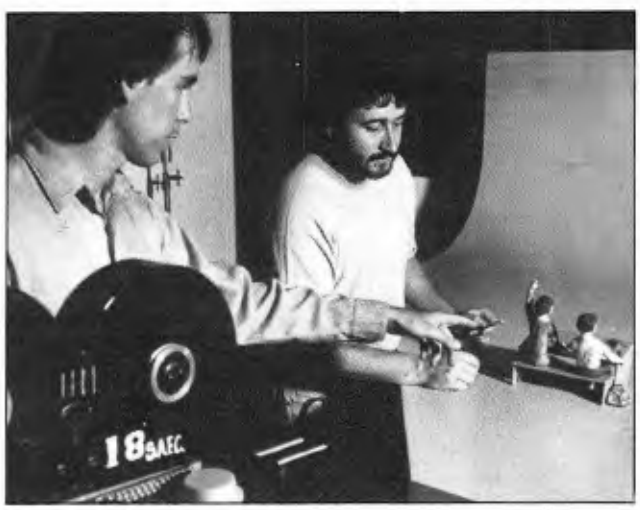
The Amiga was expected to retail for $3000; now the official price is $2495. For this you get a 512k machine with 3½in disk drive and colour monitor. PAL versions of the machine are still not available so the monitor is mandatory.

On March 19 Mobex, Atari's Australian distributor, announced the price for an equivalent system, but with a monochrome monitor, at $2399. However, by the time this issue went to press (and well after Commodore's ominously dated pricing statement of April 1) Mobex lopped $400 off this price. The monochrome monitor system now retails for $1995 and the colour system for $2495 — exactly the same as the Amiga. Watch for further jostling.

Sinclair sold

The purchase of Sinclair Research in the UK by Amstrad for $10 million throws open the question of the future of Sinclair's products in Australia. It also casts an additional and unwelcome shadow over the proposed public offering of Technology Corporation of Australia (the current distributor of Sinclair products in Australia).

According to the industry newspaper *Computing Australia* Justin Beck of TCA claims the sale will not affect the company's distribution rights of Sinclair products. But John Chandler of Mitsubishi Electric AWA (Amstrad's Australian distributor) said it would be a reasonable observation to make that his company will probably distribute Sinclair products.



These are the people to blame for Burroughs' irritating plasticine model advertisements to which you've been inflicted in recent weeks. The campaign was designed to transform the "outdated impression some people have of the company". We think it doesn't work.

President opens up north

Tom Cooper's President Computers is the second hi-tech firm to establish at Queensland's Labrador Technology Park on the Gold Coast. The new manufacturing plant will produce upwards of 300 PC-compatibles per month mostly using components from Taiwan but with an average 22% Australian-sourced content in the finished machines.

Fourteen models of PC, from a portable through to an AT-compatible, will be assembled on six production lines.

IBM churns them out

If it weren't for the fact that we were stating the obvious (to us, anyway), we'd now be crowing about the spot-on predictions in the October '85 issue of *APC* that IBM would soon abandon the 360k format for 3½in disk drives, leaving early purchasers of IBM JX computers out on a limb.

Yes, the 360k JX is no more. In its stead is a 720k version. And, yes, 360k JX machines will have to be upgraded if you want to keep up with the latest JX software. The cost of that little exercise will be "very little", according to IBM; how very little it doesn't know. The only bright spot is that 360k software will run on the 720k JX.

That's not the only change IBM has made to the JX line-up. It has also announced a hard disk unit, a 256k cluster memory kit, six networking programs

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APC III
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and nearly 40 new software packages.

The hard disk unit is a 10Mb, plus 5¼in floppy disk box with three expansion slots, allowing up to 512k of RAM. It will cost around $2500.

The 256k cluster memory kit sits on the optional cluster (networking) card and enables up to 384k of memory to be installed on the central JX system unit.

The major software package for the JX is Enable. This is a five-function suite of programs, taking up only 192k of RAM. It has spreadsheet, word processor, database, communications and graphics modules.

Think JX and you think 3½in disk. Those who thought that IBM was only half hearted about the disk had better think again.In the US, a swatch of 3½in disk products has been announced.

The most important are external 3½in disk drives for the PC, PC/XT and PC/AT micros. Also announced is an internal 720k 3½in disk for the PC/XT. These moves, and the upgrading of the JX, means that the JX can now be considered a fully fledged part of the business line-up. Data from a JX can easily be interchanged with its bigger brothers, and an IBM 'Statement of Intent' says "It is IBM's intent to offer a very high degree of software compatibility with the IBM PCs."

Sick of hearing about the JX? Well more news from IBM is that in the US it has at last released details of a battery operated lapheld PC. It is called the Convertible, and, yes, it does have 720k 3½in disk drives — two of them.

Compared to what Toshiba, Kaypro and others are offering, the Convertible breaks no new ground. It weighs about 6kg, and has a detachable 25 line, 80 column, variable contrast LCD display.

It has 256k RAM, and can be expanded up to 512k. The processor is an 80C88.

The keyboard has a complement of 78 keys. Batteries will run the thing for six to ten hours between charges. Software supplied is an application selector and SystemApps. The operating system is PC-DOS, of course, and it is compatible with PC software, naturally.

There is a range of add-ons too. For a start, there is a portable dot matrix printer that is powered by the Convertible. It can handle graphics as well as text.

For those who don't like LCD, there is an external 9in mono display and a larger RGB colour monitor, with an internal speaker. A CRT display adaptor lets other monitors be used too. Also announced is an internal 300/1200 Baud modem, and a serial/parallel adapter.

The JX isn't the only PC that IBM has decided to improve. It announced, in the US, that the PC/AT and 3270 models have had their processor speed upped by one-third, and that the PC/XT will now have twice as much hard disk storage capacity.

IBM has been slashing its PC prices in the US too. Here in Australia, it wouldn't do anything as dramatic as that. Instead it has embarked on a major advertising blitz and is offering cash back deals to PC purchasers.

Best rebate is to purchasers of a 20Mbyte AT, where $1,100 is given back. Buy a PC/XT and $600 is returned. Buy before 31st May to qualify for the offer.

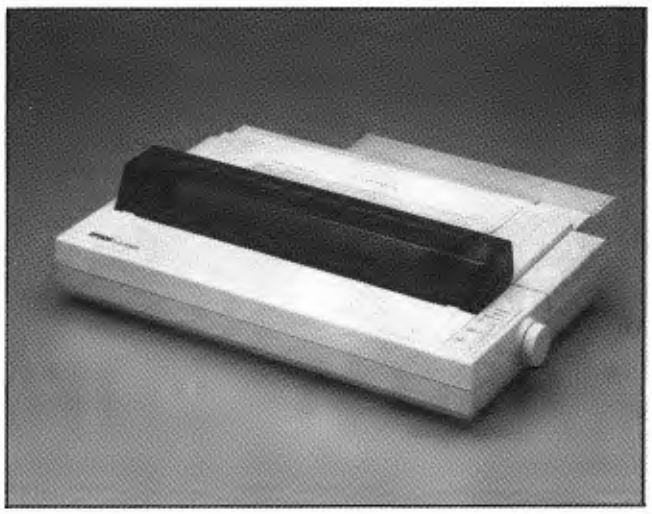
This activity might have something to do with troubles in dealer land. Following last year's price wars, dealers are going down like flies. Computer Power is offering its PC division to the highest bidder. Sands Business Systems has sacked the 35 staff in its PC division, and closed it down. IDAPS has sold its South Australian PC Division to BS Microcomp, and there are more problems rumoured.

Clones haven't made life easy for Big Blue. However, there is one new PC that the lookalike manufacturers won't be copying very quickly. It is the RT PC.

The RT is a Reduced Instruction Set Computer (RISC) machine (*See feature December '85 — Ed*). It has a simplified instruction set, but the 118 instructions are called more frequently. It is a 32-bit machine with virtual memory, novel memory mapping routines and a Unix-like operating system called Advanced Interaction Executive (AIX).

The RT is aimed at graphics and engineering users. It has a base price of $30,000 and will be available in June. An AT co-processor can be installed, so it will run PC software. Desktop and floor standing versions are available.

So, all those rumours *APC* has reported have been borne out by IBM.



A new version of the wonder-matrix printer from Epson, previewed last year, has arrived. This is the LQ1000, a wide-carriage version of the LQ800, both of which are still selling at rather higher prices than I predicted for April.

The LQ1000 is a lot quieter than the LQ1500, which is its predecessor, and the one everyone knows about.

I've been testing the LQ800 for a week, and can report myself amazed by both its speed and its quality. You plug in little print modules to change from one font to another, much to the amazement of the APC production team, who had to cope with a very different type of news printout this month.

The LQ1000 costs $1684.

Guy Kewney

The problems with wizards...

I have a sad story to relate about a Macintosh Hyperdrive — a 10Mbyte internal hard disk that has (I think) just been rendered obsolete by the announcement of the Mac Plus.

To explain the sadness, I have to talk about Wizardry (see review, 'Screenplay').

Imagine that you had spent five days locked in a dark, dangerous dungeon, trying to teach a bunch of raw enthusiasts the rudiments of survival.

Imagine that at the end of those five days, after numerous terrifying encoun-

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ters with pickpockets, footpads, and other criminals, not to mention inexplicable appearances by some very strange people who showed all the signs of being, well, dead, but were still walking around attacking passing strangers . . . Anyway, at the end of these days of training, you might imagine, these raw recruits were starting to show promise.

One of them was not just a superb fighter, but specially talented swordsman, a Samurai. Another had proved herself to be a tireless warrior, virtually impossible to wear down and kill — and, more important, very quick to heal. Still another had developed a talent for psychologically daunting enemies. He believed, himself, that he used magic; and sometimes, the effects he produced really were hard to explain away. And there was that weird character who believed himself to be in touch with God, and used to go into a strange trance whenever danger threatened. He claimed he's been praying for our survival, and since we didn't actually die, there wasn't any way of arguing with him.

Anyway, I was rather proud of this team, and I thought I'd take them round to the editorial offices of *APC*, and show them to my colleagues. Naturally, I decided to put them on a separate diskette.

The team, as you obviously realise quite soon in this fantasy, is a group of Dungeons and Dragons-type characters, which you develop in the Proving Grounds of the Mad Warlord.

The game was terribly popular a couple of years ago on the Apple II, but I never quite got into that version, possibly because of a disk fault. On the Macintosh, however, it is amazingly convincing, and an awful lot of fun.

Anyway, to save a particular character, there is a way of making a copy of the whole group, and then transferring one of them out.

You use the 'back-up characters' routine, and then the 'transfer characters' routine. I'm not stupid enough to try the experiment of 'transfer' without first making a back-up! In fact, I made three separate back-ups.

Transfer turned out (as I had suspected) to have a problem. The Mac asked for a particular disk to be inserted. That particular disk was already there. Until you inserted that disk, it wouldn't do anything.

On the Mac, taking a disk out is *not* voluntary unless you cheat and use a paper clip. Desperate, I used the paper clip, got the disk out, and put it back in again.

As far as the Mac was concerned, my tender caresses hadn't had any effect — nothing had happened. I had to turn off the power. And when I turned it on again, my special transferred characters had disappeared.

Fortunately, there were the back-ups. I told the machine to 'restore characters from back-up'. At once, all the remaining characters disappeared as well.

I examined the disk, and discovered several files called back-ups, all containing OK bytes. I phoned Sir-Tech in the States.

'Do you know,' I asked in polite tones, 'of any problems with the Hyperdrive on the Mac?'

'Oh,' someone said, 'you mean the back-ups?'

I can think of several simple improvements to this game. For example, it should be easier to do stupid things without the system (otherwise known as the Dungeon Master) protecting you. If you cast an immense conflagration spell and there are no monsters about, the system shouldn't say (solemnly): 'You can only cast that spell in combat,' but should instead insist on blasting one of your own party — who would then need to be dragged back to the Temple for an expensive cure.

And the three-dimensional maze you wander through is a real mapping puzzle, but it would be better if it used the QuickDraw routines (you see them on the Mac when it opens up a window, with little blurry lines to simulate speed of movement) to show which way you are turning.

And although the manual insists that 'this is an Equal Opportunities Universe', I'm afraid it is painfully obvious that it isn't. For example, should you create a character called Hilda, and subsequently get her cursed to the point where there's nothing to do except retire her, you will be told: 'Hilda will spend the rest of his days in Flayhhrda!' And should Hilda get clobbered by an ogre who chops off her head, you will be told: 'An ogre hits Hilda for 18 damage, and kills him!'

All the warriors you meet in the dungeon (with the

Not only did Morrow fail to win the most famous contract of the year in the US — to provide portable micros to the tax men — but because everyone said that IBM was going to launch its portable and win the contract, everyone stopped buying the Morrow version.

The company is now in receivership.

Meanwhile Zenith, which builds an identical machine, did win the contract. The only change: please, said the Inland Revenue people, could you use the nice dark screen that Morrow has, rather than your swimming-pool blue?

The people at Morrow are reported to be upset. Sources inside the American Government have hinted that they got wind of Morrow's financial problems, and so decided not to go ahead with the offer from Sperry, using Morrow-built machines.

Alas for Morrow: had it won the deal, it would have had no financial problems. And worse, with Zenith winning the deal, Morrow doesn't get an extra cent, because Zenith paid outright for the design on a no-royalty, once-down basis.

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exception of Stately Ladies) are male. There are Ninja fighters, who are described as 'Men in Komonos'; there are armed fighters, called 'Men in Armour'; and there are magic users, described as 'Men in Robes'. It would be very simple for the computer to swap the words Men and Women on an equal opportunity basis. It would be very simple to say: 'Hilda can look forward to long years of content in sunny Flayhhrda,' or 'Hilda is hit by an ogre, for 18 points of damage, and is dead.'

Of course, you could argue that dungeons are *not* Equal Opportunity Universes. Why not? It would more accurately reflect the real world, after all. But to pretend that it is, when it isn't, is pure hypocrisy.

However, I have had a whale of a time in this dungeon, and I look forward to new dungeons in which to take my incredibly tough characters.

But should you take my enthusiasm as a recommendation, then do take the warning with it: the back-up routine has a bug in it. Sir-Tech's executives say that they 'just don't know when the programmers will get it sorted: they haven't found out what's causing it yet.'

If you have a Hyperdrive, don't run Wizardry on it. Boot up on floppy disk.

Guy Kewney

Briefs

Rosser Communications has taken over the entire stock and distribution of the Xyllyx videotex modem and software package from Rank Electronics. Rosser is on (02) 449 8233 . . . The 'trivia' theme has been applied by a Melbourne-based programmer to produce a range of tutorial quizzes cum study aid. The Trivia Toolbox comes complete with 29 electronic trivia 'books' covering subjects like programming, television, literature, astronomy, medicine and chemistry. Trivia books are simply indexed files (indexing is performed by a program called Author which is included in Toolbox) so modifying and adding to the 'triviabase' is straightforward. The Trivia Toolbox retails for $39.95; call (03) 751 1263 for more information . . . MacBridge is a hardware/software communications package which allows PC-compatibles to transfer files to Macintoshes and use Apple's LaserWriter by linking them into an AppleTalk network. MacBridge costs $1295; call (02) 922 2022 for further details . . . Pick is now available on the PC/AT providing multi-user and virtual memory capability. As well as a built-in relational database with dictionary file structure and an "English-like non-procedural query language", Pick Basic is also available. Call (03) 267 2699 . . . From the company which supplies Metrotel — the leading videotex editing software — comes MView. It's a videotex emulation package for MS-DOS based machines and is specifically designed for use by engineers. It retails for $250. Call (02) 212 6866.

Coming soon

Some months ago, I promised to get details of a method of upgrading Amstrad PCW8256 machines into 512k models. As readers continue to remind me, I have failed to do this. The problem has been simple enough: Amstrad has been preparing an official version of 'fat' Joyce, which includes a 720k extra disk. And my source of how to make the upgrade has been one of the people working on the new system.

Hopefully, I'll be able to get information, now, on what links to change. Sorry for the delay, thanks for your patience, and there'll be another excuse soon . . .

Guy Kewney

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P.S. Our deepest apologies for the long delays to the many, many hundreds of inquirers for our 64/80E (Apple IIe compatible) computer, we had a few technical bugs to iron out. Both software and hardware have been totally redesigned and USA registration has been applied for. If we proceed with it, it will be a detachable unit with dual CPU, 2 d/drives, colour card, 128k, 80 column and monitor for under $1400.00 for non-members and under $1000.00 for HOME-SHOP member, we'll keep you posted on it

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Atari 1040ST

How do you improve on a good idea? The 1040ST, Atari's upgraded and enhanced 520ST, has 1Mbyte of RAM and an internal 720k disk drive. Nick Walker considers it to be top of the compatibles chart.

In recent months, the *APC* office has begun to resemble the warehouse of an IBM PC-compatible distributor — with boxes and boxes of lookalikes arriving for possible Benchtesting. Occasionally someone will unpack one, set it up on a desk, declare 'Yes, it's a PC-compatible', and a day later put it back in its box.

If we are really lucky, we might unpack a machine that's finished in brown instead of IBM grey, or perhaps it will have an amber screen instead of the usual green. It's not the outdated PC architecture or even the ancient, unfriendly MS-DOS operating system, but the sheer volume of practically identical machines that bores me. Consequently, any machine which breaks the mould of IBM compatibility, regardless of its merit, tends to generate more than its fair share of interest.

One such machine, launched in June 1985, is the Atari 520ST, which offers the processing power of a 68000, a Macintosh-like environment, a high-resolution monochrome monitor, and a 3½in floppy disk drive — all for $1995. At least as far as specification is concerned, the 520ST has made other machines such as the IBM PC and the

The stylish, sloping keyboard features angled function keys, and power and disk drive lights

Apple Macintosh, appear grossly overpriced.

However, at the time of the 520ST's launch, there was still a big question-mark over the state of Atari, and many people were questioning whether the company had the resources to make a sucess of the 520ST. Now, almost a year later, Atari has launched the 1040ST as its 'top of the range' machine — complete with 1 Mbyte of RAM (1000k) and an internal 720k disk drive — to sell alongside the 520ST. I decided to take a look, not only at the 1040ST, but also at how the market has progressed for all ST owners.

Hardware

The Atari 520ST is one of the nicest-looking machines I've ever seen, and it's good to see that those good looks have been retained on the 1040. Despite the inclusion of an internal floppy disk drive and an internal power supply, the casing has increased very little in size. It's rather deeper and taller but, in terms of the amount of desk space it occupies, there is almost no difference. The sleek, grey casing, with function keys, ventilation slots, a floppy disk access light and a power light all sloping at the same angle, give the machine a very elegant appearance.

The ports which feature on the 520ST are all there on the 1040ST, and make up one of the fullest complements I've seen on a micro. Of the four sides that could possibly hold ports, three of them do so, and the one which doesn't, holds the floppy disk drive. A little tunnel under the front of the keyboard leads to the two mouse/joystick ports; although this makes the insertion of a mouse or joystick extremely awkward, it does mean that no extra room is needed on the right-hand side for plugs, and the wire comes out at the natural angle for use. It might also bring back some nostalgic memories for owners of the original Atari 400 and 800 8-bit micros, which feature four forward-facing joystick ports.

When running joystick software, both STs use standard joysticks and most software uses the second port, so if you have a mouse in port one and a joystick in port two, there shouldn't be any need to change them.

Along the left-hand side of the 1040ST there is a ROM cartridge port and two MIDI ports — MIDI-in and MIDI-out — for the connection and control of electronic instruments such as synthesisers, drum boxes and sequencers. At the moment there is no software available for the cartridge port, although I know of a version of Basic which is being developed and is claimed to pack a lot more power than ST Basic.

The back of the machine is, like the 520ST, heavily populated with ports. From left to right it features ports for: serial RS232; parallel Centronics printer; high-speed hard disk port; additional floppy disk port; monitor; power switch; power in; and, finally, there is the reset button.

The right-hand side of the machine features an integral 3½in, double-sided disk drive which gives a formatted capacity of 720k. The drive is also capable of reading, writing and formatting in the single-sided 360k format as used with the 520ST.

By making the disk drive and power supply internal, Atari has enhanced the system in a further respect. The 520ST requires hefty power supplies for the main system unit and the disk drive; these unsightly boxes have been eliminated on the 1040ST.

One thing that's certain about the 1040ST is that Atari does not intend users to get inside it. This machine is the most difficult one I've ever tried to open — I'm still scarred from the fight. On the underside of the machine are 11 screws of different lengths; removing these allows you to take off the top covering where you are confronted with an expanse of shielding, and a small silver box in the right-hand corner — the disk drive. One of the reasons why Atari has made it difficult for users to get inside the system is that the shielding for the internal power supply is not a sealed unit, so operating the machine with its lid off

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could be dangerous.

But I was still interested to see if the PCB had been changed, so I removed the floppy disk and the keyboard, and set about removing the shielding. My first obstacle — three Phillips screws; no problem. Then I noticed the 11 metal tags which have to be bent before the cover will come off. When I twisted these, things looked hopeful, but no — the shielding goes under the rear port. At this point I gave up; at least I could peer at the PCB by bending the shielding.

The layout of the 1040's PCB is totally different from that of the 520, presumably to incorporate the extra RAM. There is, as you would expect in order to maintain compatibility, no change to the logical architecture. Even with 1000k of RAM onboard, the chip count is still remarkably low due to the use of four large custom chips for such functions as graphics, DMA (Direct Memory Access) and timing.

The first 520STs were supplied with the operating system on disk, and loading it in gobbled vast amounts of RAM. At that time, there was speculation that it would remain that way. However, all 1040s have the operating system in ROM as standard, and the majority of 520s have now been updated. These ROMs include the TOS operating system *and* its friendly interface, GEM.

The 1040ST can be supplied with either a high-resolution black on white monochrome monitor or a medium-resolution colour monitor. While the monochrome unit is of Atari's original manufacture, the colour unit is actually a Thomson unit packaged in a similar grey plastic to the machine. Both monitors give a good picture when used with either ST, but the colour unit is not quite up to the standard of the original Atari colour monitor.

The bundling of a third-party monitor is typical of the new, quick-moving Atari. Since Jack Tramiel took over at Atari, various products have been seen at shows, and assurances have come from the company that these items would soon be in production — only to be dropped a few months later. The usual reason Atari drops products is that the company can't produce them cheap enough and, as soon as it can, the product will reappear. The really worrying thing is that I *believe* Atari.

The dropping of Atari's $1000 CD-ROM was a very big disappointment and has probably cost the company dearly in potential sales revenue. In the US, a company called Activenture has taken the CD-ROM player and the Grolier encyclopedia (used to demonstrate the Atari unit) and is making it commercially available.

Unfortunately, the Activenture unit will probably cost rather more than $1000, even if it is ever available in Australia. The one glimmer of hope for this product could be provided by Warner Brothers, Atari's erstwhile owner, which still has a large stake in the company. Warner Brothers is currently installing its own CD manufacturing operation, so hopefully we might see the original unit soon.

The official announcement of the 1040ST was accompanied by a preview of a plug-in box which gives IBM compatibility to the ST range. Like a similar product which plugs into the Macintosh — Mac-Charlie — this extra box is really an IBM-compatible which uses the 1040ST as a terminal and a RAM disk. The prototype unit I saw had an Intel 8088 processor running at 4.77MHz and 512k RAM, and a 5¼in floppy disk drive was connected to the ST via the hard disk DMA port. When the 1040 is used in its native mode, this PC add-on can act as a second disk drive, giving a formatted capacity of around 360k. No price is available for this box, but I suspect that whatever the price tag, it will have difficulty competing with the current crop of Taiwanese clones, and will only appeal to 1040 users who want a neat-looking, single system and IBM-compatibility. The box's planned release date is expected to be in July.

'From what I've seen, there are going to be some incredible games programs for this machine.'

At the same time that the PC-compatible box was announced, Atari also publicised the 520STM, a version of the 520ST which will sell for about $1250. For this price you get a 520ST console with an extra port — modulated television output, which allows you to connect a standard television set to the system. However, you *don't* get a monitor or, more surprisingly, a disk drive, so you won't be able to do anything with the system until you buy a disk drive at an extra $549. These figures give an interesting breakdown of the pricing of the separate components which comprise an ST system, and marginally lowers the cost of an entry-level system. I would like to see the TV modulation added to the 520ST and the 1040ST, so that purchasers of the bundled monochrome system can at least use their home televisions to play games.

On a sour note, after conversations

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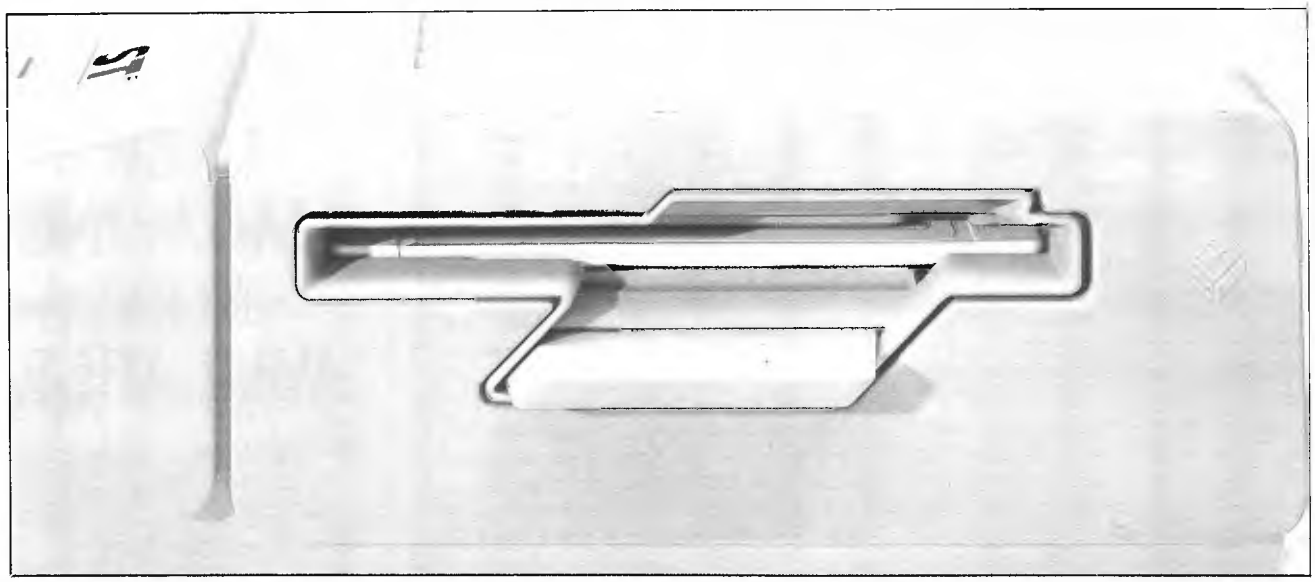

The unsightly power supply boxes of the 520ST have been eliminated: the 1040ST features an integral disk drive

with users and dealers of the 520ST, it appears that there is some doubt as to the reliability of the system. One dealer reported 18 of his 30 systems being returned to Atari and, of the users I know, everyone has experienced at least one hardware fault. As a colleague remarked after reviewing the 520: 'There's a price to all this cheapness.' So far, his pessimism has proved to be justified.

Software

Having both TOS and GEM in ROM significantly improves the performance of the 1040ST, and alleviates the need to insert a system disk each time you reboot the system. I won't go into any depth in this Benchtest about the operation of GEM, as it has been well covered before and also in the original 520ST Benchtest in June 1985. However, just to refresh your memory, GEM is a graphics-based friendly interface which usually sits on top of a standard operating system — in this case, TOS.

There is no way to get to the underlying operating system, TOS, a version of CP/M 68k, on the ST, which is a shame, because for certain applications such as program development, it could be a powerful boon. Interestingly, Atari is now denying that TOS stands for Tramiel Operating System, even though Jack Tramiel himself said that was what it stood for in January 1985. It now apparently stands for The Operating System. *(Personally, I couldn't give a TOS (sic) as long as it works.)*

When it was launched, the 520ST was going to be bundled with Basic; Logo; the GEM Write word processor from Digital Research; and GEM Paint, a graphics painting program also from Digital Research. In fact, the very first machines were bundled with Logo and a promise of the other packages when they became available. The deals with Digital Research fell through, so Atari cobbled together an alternative bundle which consists of a database — DBOne; two word processors — ST Writer and 1st Word; an unfinished graphics program — Neochrome; a simple doodling program; and a game. Sadly, the bundled software has now been whittled down to Basic, Logo and Neochrome, which doesn't really provide the business-machine image Atari is trying to push. The computer languages in particular, while being good implementations, make little use of the GEM environment, especially in terms of the GEM features which a user can access.

'While there is no doubt that the ST has the power to run serious business applications, what is really needed is for a major business software house to convert some applications for the ST.'

At least one good thing has come from Atari's late delivery of ST Basic: while users were waiting for it, C became available from a number of different suppliers, and it seems to have established itself as the standard for serious programming on the ST. Even magazines are publishing C listings, so perhaps we might see the demise of that awful, non-standard language Basic at long last.

With regard to commercially-available applications for the 1040ST, Atari claims that there are now 300 applications available (with approximately 150 already in Australia) and I have no reason to disbelieve the company. Two clear trends are emerging: firstly, the majority of these applications are games, and there is definitely a contingent of ST owners who see the machine as the next step up from the Atari 400/800 as the ultimate games-playing machine. From what I've seen, there are going to be some incredible games programs for this machine. Secondly, there is also a vast quantity of programming languages and utilities available for the ST, and it seems, to have attracted a lot of serious home users/programmers who adore all the power of the 68000 and the high-quality graphics. Business applications are a little scarce, though to some extent that can be attributed to longer development times for business applications. While there is no doubt that the ST has the power to run serious business applications, what is really needed is for a major business software house to convert some applications for the ST, and some assurances from Atari as to reliability.

It is nice to see Atari producing software, as Jack Tramiel stated that there would be no more company-produced software. Two of these packages stand out: a CP/M emulation package which, effectively, opens up the whole range of CP/M programs (provided you can find a way to get them into Atari's 3½in floppy disk format); and

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an all-singing, all-dancing telecommunications program, Fastcom. For a real trip down memory lane, Atari is also developing a version of the game which so beautifully revealed the capabilities of the Atari 400/800 back in 1980 — the all-time classic, Star Raiders.

Documentation

Three manuals are included with the 1040ST: an *Owner's Manual;* an *Atari Logo Sourcebook;* and an *Atari Basic Sourcebook.* The manuals are spiral-bound, professionally produced, and contain a lot of information in a reference book-like format.

However, no attempt has been made at a tutorial section, and very few examples have been used. Additional books would be required by newcomers to either Basic or Logo, whereas GEM is easy to use and learn, and sufficient information on the interface is included in the *Owner's Manual* for the benefit of most ST owners.

Prices

The 1040ST with a monochrome monitor retails for $2995 and with a colour unit for $3495; as a comparison the 520ST, with half the memory and half the disk capacity, sells for $1995 and $2495 respectively for monochrome and colour systems. No plans are afoot to reduce the price of the 520ST. The 520STM will cost $1249. Atari will be offering an upgrade for 520 owners to 1Mbyte of RAM, though this can easily be achieved with a little electronics knowledge, and no doubt some third-party companies will also offer the service. (Third party or user upgrades will, of course, invalidate any remaining guarantee.)

In an effort to regain the confidence of dealers, the 1040ST will only be sold to specialist computer dealers who have the facilities to demonstrate the product on an individual basis. This will send a lot of customers back to their local computer shops and away from the Grace Bros and Myers, which must be a good thing.

The additional products for which prices are known are: hard disk — $2499; floppy 360k drive — $549; floppy 720k drive — $699. The price of the CP/M emulation software is not available at press time.

Conclusion

When Atari launched the 520ST there was nothing to compete with it, and there still isn't. Now, with the 1040ST and the power it offers, there is an even wider gap between an ST and the competition. Amstrad may be cleaning up in the cheap-and-reliable market with the PCW8256 and the CPC6128, but for those of us who are still enthusiastic about the latest technology, the 1040ST represents a new entry point in home computing. I'm impressed. **END**

Benchmarks

BM1	0.85
BM2	2.11
BM3	5.83
BM4	6.37
BM5	7.74
BM6	11.87
BM7	16.95
BM8	9.42
Average	7.64

All timings in seconds. For a full listing of the Benchmark programs, see End Zone.

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BANKS' STATEMENT

Dearly departed

When the fun disappears from computing, it's time to think seriously about business implementation and rising costs. Martin Banks examines the shift in the market-place.

I recently had the temerity to accept an invitation. With no respect at all for the civilities of life, I girded my loins and set off to the wicked city to attend that great event in all journalists' poor and humble lives — the press conference. This one was being organised on behalf of a software company that many of you may have heard of. Novell Inc has made quite a name for itself producing networking software systems for personal computers, and various personages from that emporium were in town to tell us what they had done *now.*

This turned out to be, among other things, the final nail in the coffin of King Computasarfun. You remember him, of course; he was the one who had us all buying computers for splendidly hedonistic reasons, such as playing Space Invaders and Pac Man. Now the King is dead, and there is no fun left in the computer industry at all.

Novell's nail came in the form of fault-tolerant software for its networks. Whatever goes wrong — a simple disk crash in which the directory is wiped or a disk system grinds itself to dust — Novell has a product that will allow the user to recover lost data and look splendidly efficient.

This is, of course, the end as far as King Computasarfun is concerned. Not only does this reduce the will-it-do-anything-at-all-that's-understandable fun of the early days of personal computing to little more than myth and saga, it even ruins the fun of owning a modern PC.

No longer will we sit at our desks, midnight oil near burned away, system memory full of fine prose or hot program, and hit the Return key with crossed fingers. From now on, we will have fully recoverable, don't-worry-about-a-thing-matey-I'll-find-it-for-you-it-must-be-in-here-somewhere fault tolerance systems that will, just to be on the safe side, do the work for us in the first place.

For those in business, or doing anything worthwhile with their computer systems, something like this is not only sensible but essential. But for all those funsters out there, hoping that this is just a passing aberration in the great adventure game, it is the long walk into the terminal void of boredom.

Yes, even the personal computer has now had to succumb and become just a boring old business tool, and the reason is . . . well, business. Last year was not just a turning point for many companies in the industry, it was the year in which they drove straight into the brick wall. Why they did this is not that difficult to define, especially with the journalist's luxury of perfect hindsight. Where it now leads is also, to some extent at least, equally definable.

The 'brick wall' is that the 'bought from' market was used up; this has meant the industry having to go out and 'sell to'. In practice, it hasn't had too much to offer, especially when it has been trying to play the game of high-volume, low-cost merchandising. The machines have not been cheap enough to be merchandised, nor have they been, like cans of baked beans, consumable.

The market demand has, therefore, been easily met and, unlike the hi-fi business, there has been no standardisation of software formats such as records and tapes to drive the market from outside. Some companies have found that low prices (even with good value for money) do not make for a continual market or a satisfactory profit margin.

The answer, I feel, lies in a direction I first put into words many years ago; the cost of systems, I'm afraid, has to increase. What is more, that is exactly what it is now likely to do. The personal computer has at last been accepted in the bosom of the market-place it has always fancied for itself — big corporations.

The effect on the PC industry could be quite marked, however. Big corporations will require different things from the PC industry than the small-business user — fault-tolerant networking software is just one of them. They are also going to require bigger systems generally, but this does not necessarily mean bigger individual boxes. Rather, it means things like networking, multi-user systems, clustered work-groups and mainframe communications. These are the things which will make the integrated systems that the corporate users need.

In practice, of course, the individual boxes will also get bigger, and this threatens some additional changes. Bigger systems structures running bigger boxes will mean different operating system requirements. The 640k limit of MS-DOS is already a hindrance to many applications, and its single-user, single-tasking orientation will contradict the aspirations of the corporate user. Presumably these are problems which Microsoft intends to face with Version 4 of the system, when it eventually appears.

It seems reasonable to suggest that, if it fails to face these questions, the market-place will move on to other things despite the dominance of the DOS applications software base. It is probably no accident that Intel, part-owned by IBM and supplier of Big Blue's processor chips, has chosen Unix as an operating system for the new 80386 32-bit processor which will certainly power a future generation of PCs. It is a system which has the power and facilities required, and its current user-unfriendliness can be overcome. I used to think Unix wouldn't make it in the commercial big league, but now I'm not so sure.

The integration of PCs into large corporate data processing structures will also lead to a growth in 'old' products, such as applications written in Cobol; this is, after all, what the majority of corporations already use.

And the upshot of all this? The systems will become more expensive, and the sales volumes will drop a little. The margins for the PC makers will improve, however, and they will be better able to service genuinely the needs of other, smaller users. These in turn will have to learn that 'service' usually doesn't mean the cheapest box in the shop.

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YANKEE DOODLES

Over at Apple everything's looking rosy as Steve Jobs acknowledges a bitter-sweet accord with his former employer. Just some of the gossip this month from our US correspondent David Ahl.

A gentlemen's agreement

Apple Computer and Steven Jobs have reached an out-of-court settlement that bars Jobs from marketing any computers produced by his new firm, Next Inc, until July 1987. Apple also has the right to inspect the new machine to determine if it violates any Apple patents or uses Apple proprietary technology. Furthermore, Jobs has agreed not to use certain other undisclosed technologies.

Jobs, the former co-founder and chairman of Apple, said: 'We're quite happy to comply because that's what we were going to do all along.' Jobs said that his new computer, a sophisticated, $US10,000 workstation aimed at the university market, wasn't expected to be available until late 1987 anyway.

Apple sued the 30-year-old former chairman shortly after he resigned last September. In its suit, Apple accused him of 'secretly scheming' to use the company's research for his new venture and then luring away key employees to join him. Indeed, when he left, Jobs took five key Apple employees with him including Richard Page, senior engineer on the Macintosh project and, in the next few weeks, hired six more people, mainly middle-level managers. Under the settlement, Jobs agreed not to hire any more Apple employees for six months.

Apple will have 30 days to inspect Jobs' computer and software to determine whether they use any of the company's proprietary technology. Negotiating a 30-day limit on Apple's investigation of his new machine is considered a real coup for Jobs by experts in the field. In disputes over trade secrets, such as investigations can drag on for months or even years, disrupting the new company's marketing plans and leaving it vulnerable to competitors.

The settlement calls for Jobs and Apple to resolve any future disputes over technology by arbitration. Both parties seem happy with the accord, although there is still a bit of mudslinging going on in the trade press and behind the scenes.

New offerings flood in

Perhaps not wanting to get lost in the confusion of Fall Comdex or holding off for other reasons, manufacturers have recently released a flood of new products. Here is a small sampling.

Online Computer Systems of Germantown, MD, in conjunction with RR Bowker and International Computaprint, announced an IBM PC-based Electronic Delivery System using compact disk read-only memory (CD-ROM) technology. The system, including an IBM PC, 512k, a floppy drive, a monitor, a CD-ROM unit, a printer, and retrieval software, is priced from $US3000.

National Software Enterprises of Marietta, GA, introduced NSE-Demo Maker, a $US125 software product designed to capture screen images on an IBM PC. It allows users to save screens from any application, edit them, create new screens, and demonstrate the features of an application without running the program.

Enertronics Research of St Louis, MO, announced Enercharts, a presentation graphics system said to provide two and three-dimensional charts and the ability to merge up to four graphics files on one screen. The package provides pie, bar, line, Gantt, high/low and scatter charts. It runs on an IBM PC with an enhanced graphics adaptor.

The WSM Group of Tucson, AZ, released its full C compiler, Hyper C 6800, for the Apple Macintosh. The compiler includes bit fields as well as extensions, and is said to allow simple interfacing to the Macintosh ROM Toolbox routines. Hyper C costs $US200 including a C preprocessor, a compiler, a 68000 assembler, a linker, library routines, and interface files.

Softdesign of Miami, FL, is offering Maclightning, a random access, memory-resident spelling and grammar checking package for the Macintosh that allows users to access and check multiple data libraries and reference works. The package includes a 31,000 word dictionary and costs $US100.

Microsoft has released an enhanced version of Multiplan for the Macintosh which includes an option to print in ASCII mode (much faster), variable fonts, new font sizes, and a second spreadsheet window. Version 1.1 also includes seven additional financial functions such as net present value, internal rate of return, and future value. The price remains at $US195.

Another enhanced Mac package is Straight Talk Version 2 from Dow Jones & Co of Princeton, NJ. It provides access to all 39 databases of the Dow Jones News/Retrieval Service as well as other information services. It can download programs as well as data, save directly to disk, and print while on line. The price is $US95.

Buttonware of Bellevue, WA, has released PC Style, a $US30 software package that analyses the writing style of documents. It gives information about the frequency of use of action verbs, long words and personal words; words per sentence; and readability level. At the end of the analysis, a report details the findings.

Random bits

Zenith has reduced the prices of its desk-top and portable computers by between $200 and $300. This follows major across-the-board price reductions by industry leader IBM . . . Compaq and AT&T are developing computers based on the Intel 80386 MPU. The 386 can address up to four gigabytes of main memory and 64 trillion bytes of virtual memory, and processes data 32 bits at a time . . . Microsoft is working on an all-new version of DOS for the 386, as well as a new version of DOS for existing 286-based machines that will run in the so-called protected mode, allowing users to address a full 16Mbytes of memory. Apple Computer's plan to create a venture capital kitty to lure emerging third-party software companies into the Macintosh environment is getting an indifferent reception. Apple has put $US20 million seed capital into the fund aimed at backing start-up or marginally profitable software houses . . . The new rage: in the past 15 months, spelling checkers have been added to over 50 word processing packages. Dictionary sizes range from an ineffectual 3000 words in Mind Reader to 170,000 words in Volkswriter Deluxe . . . I'm told that the empty socket on the Atari 1040 ST is for a soon-to-be-released graphics co-processor that provides an astounding 1024 X 1024 pixel resolution. And that unidentified socket on the back of the new Mac is for a CD-ROM input device. END

Compaq Portable II

Despite the uncertainty of the IBM PC/AT market, Compaq has decided to launch a cut-down version of the PC/AT in the shape of the Portable II. Smaller and lighter than its peers, the machine took Peter Bright by surprise.

Compaq Computer Corporation has had a short, but highly distinguished, career. It started off by daring to compete with IBM and invented the idea of the IBM-compatible transportable micro.

Compaq's original product is still available, but its range has now broadened to include IBM PC/XT and IBM PC/AT-compatible desk-top and portable micros, all of which are technically superior to IBM products. This strategy has turned Compaq into a company which recently recorded turnover topping half a billion dollars.

Although the IBM PC/AT market is still in a state of flux, and it still has to be proved that the AT portable market exists at all, Compaq had decided to launch its second portable AT clone. Called the Portable II, it boasts an 8MHz 80286 processor and a 10Mbyte hard disk in a package 30 per cent smaller and 20 per cent lighter than previous Compaq portables. We decided to take a look.

Hardware

While I have always had great admiration for Compaq machines *technically*, you could hardly describe them as works of

art *aesthetically*. And the Portable II is no exception. In fact, externally, there is very little to choose visually between the Portable II and any other Compaq Portable.

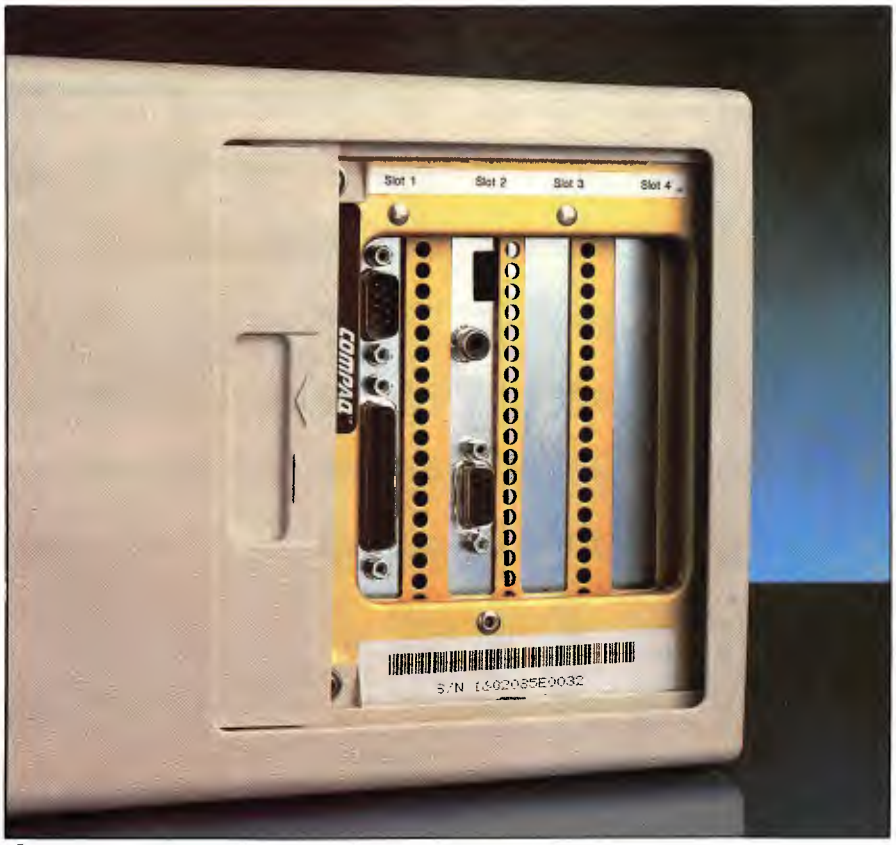
In fact at 45cm wide by 19cm high by 35cm deep, the Portable II represents a 30 per cent decrease in volume from the Portable 286. More importantly, perhaps, at 11.6kg for the basic and 11.9kg for the hard disk machine, the Portable II is some 20 per cent lighter than the Portable 286. While a 20 per cent weight reduction is to be welcomed, I still found the machine cumbersome.

When the machine is rigged for carrying, there's very little external evidence that it's a computer at all. The keyboard attaches to the front of the machine via two rather unsubstantial clips. I soon found that unless I was very careful doing them up, the keyboard would drop off when the machine was put down.

The only object on the rear panel of the machine is a nice, large, warm leatherette carrying handle. The comfortable nature of this handle almost compensates for the machine's otherwise ungainly appearance when it is being carried around.

The Compaq Portable II looks rather ungainly when packed for carrying

Setting up the Portable II when you have arrived at your destination requires two things: (1) a suitable power point; and (2) strong finger nails. The reason for the former is obvious, and the latter is necessary because the ineffective keyboard clips I mentioned earlier can play havoc with your beautifully manicured hands.



Sliding lids on either side of the casing cover the machine's I/O ports

Once the clips are released, the keyboard can be removed to reveal the front panel of the computer. The mouldings for the front panel are finished in a darker shade than the rest of the casings, which are finished in standard business computer cream.

Most of the space on the left-hand side of the front panel is taken up by a 23cm green monochrome display. To its right are a 10Mbyte half-height, 5.25in hard disk and a third-height, 360k IBM PC-compatible 5.25in floppy disk drive. This is hidden by a little flip-up cover which incorporates a piece of transparent red plastic so that you can see the drive access LED.

Below the disk drives is a small rotary knob which controls the brightness of the display, and a hole which the keyboard cable disappears into. Unlike most other portable micros, the keyboards on all Compaq portables are always permanently attached to the rest of the system via a short length of coiled cable. When the system is rigged for carrying, the cable disappears into the hole in the front panel so that it doesn't snag.

Both the left and the right side panels on the Portable II house sliding lids which cover I/O connections. On the left-hand side, the cover slides back to reveal the on/off switch, vents for the internal fan and the socket for the power cable.

The right side cover reveals plates for four IBM expansion cards. On the basic machine two of these are taken up by an RGB/composite video card and an RS232 serial/Centronics parallel printer card. This leaves two slots (one IBM PC standard and one IBM PC/AT standard) free for the user to add his own cards.

The final area of interest on the outside of the machine is a large hatch on the underside of the main unit. This incorporates two hinges: one at its edge to allow it to be opened; and one in the middle which allows the cover to fold back on itself. This arrangement means that it is possible to lock the cover in place to form a foot on which the system box can rest, which allows you to alter the viewing angle of the screen without having to resort to a pile of old telephone directories.

As well as serving as an adjustable foot, the cover also hides a large compartment designed to house the power cable when the system is being carried around. Included in the compartment is a dummy mains socket which holds the mains plug in place and stops the cable from rattling around. Although I've seen this idea before, it's the first time I've seen a socket converted to take Australian pin plugs rather than American plugs — a nice touch.

Inside, everything is rather more cramped than you'd expect for a desk-top micro. Most of the front of the box is taken up jointly by the monitor and associated high-tension circuitry and the disk drives. Behind these in the rear left corner is the power supply unit: this is rated at 130 watts with a peak loading of 165 watts, which should be sufficient considering the limited number of expansion slots and the fact that you can only have one hard disk.

In the rear right-hand corner of the unit there are four IBM PC and PC/AT expansion slots, two of which are occupied. The rationale for this is that two spare slots should be sufficient for most needs — if you need more, you should buy one of the other machines in the Compaq range.

As you would expect in an IBM PC/AT-compatible, the main processor in the Portable II is an Intel 80286. This is normally clocked at 8MHz, although, like other Compaq machines, it can be switched down to 6MHz under software control for added PC/AT-compatibility.

The review machine was supplied with 640k of RAM which is the maximum that can be fitted to the motherboard; however, RAM can be taken up to 2.1Mbytes without wasting an IBM expansion slot by using a custom-designed RAM expansion card. The absolute maximum RAM is 4.1Mbytes, but you have to use up an IBM slot to go that far.

As well as housing the main processor and memory, the main PCB also includes a battery-backed clock/calendar and controllers for the hard disk and the floppy disk. Interestingly, the Portable II is only available with 360k disk drives, rather than the high-capacity 1.2Mbyte drives sometimes fitted to the IBM PC/AT. Compaq argues that no-one is releasing software on the 1.2Mbyte disks and if you want them, you can always buy the Portable 286 instead.

The general engineering idea behind this machine seems to be to provide a cut-down IBM PC/AT clone with fewer expansion slots, a smaller hard disk and a floppy disk. This allows Compaq to make the Portable II smaller and lighter than had it gone for the full IBM PC/AT specification — without sacrificing too much.

The display provided with the Portable II is much the same as the rest of Compaq's portable micros. The 23cm green screen is built onto the front panel of the main unit which provides a very clear, sharp display; the only trouble is that Compaq has used quite a long persistence phospor in the screen, which can lead to some blurring when the display is scrolling quickly. Although this effect can be minimised by turning down the brightness control, the system doesn't come with a contrast control, so it isn't possible to alter the difference between normal characters and high-intensity characters. This is a shame, because I found the high-intensity mode too distracting, and I would have liked to turn it down a notch.

Controlling the monitor is Compaq's standard hybrid display adaptor. I have always regarded this as one of the best available. As well as driving the internal monitor, the adaptor is also capable of driving an external RGB or composite monitor.

The nicest feature of the Compaq display adaptor is that one card emulates both the 720 × 350 pixel IBM monochrome text adaptor and the 640 × 200/320 × 200 pixel IBM colour graphics adaptor. This means that it is capable of running software written for the high-quality text of the monochrome monitor or software written to take advantage of the graphics facilities of the colour graphics adaptor.

Of course, if you're running colour software on the green screen Portable II, you can't expect colour pictures. However, the Compaq display adaptor does have something called 'grey scaling', which means that different colours can be represented by different tones of grey (or green in this case).

Overall, I found the quality of the display well up to the standard of previous Compaq machines and far superior to the display provided by standard IBM machines.

The Portable II keyboard is totally separate from the rest of the unit. It connects to the system box via a short length of coiled cable which disappears into a hole in the system box when the machine is rigged for carrying.

In perspective

At first sight, the Portable II seems to sit somewhat uncomfortably in Compaq's product range. As far as desk-top machines are concerned, Compaq has the DeskPro IBM PC/XT compatible and the DeskPro 286 IBM PC/AT-compatible. Both of these are very good, successful machines.

As far as portables are concerned, Compaq already has the original Portable/Plus IBM PC/XT compatible and the Portable 286, which is a full function IBM PC/AT clone. So how can the company have room for another IBM PC/AT portable?

I believe the answer lies in the fact that, although on paper the Portable II is an IBM PC/AT clone, functionally it's more like a high-performance PC/XT. If you think of the machine in this light, then it starts to make more sense for the user who wants a portable with more power than an IBM PC/XT, but who doesn't need all the extra features, weight and bulk associated with a true IBM PC/AT clone. In these terms the Portable II can take sales both from potential IBM PC/XT and IBM PC/AT buyers.

If it works, this positioning could be very interesting. The only other machine that I can think of which is being marketed in this way is the Olivetti M24SP. This achieves the same ends from another angle by using a souped-up 10MHz 8086 processor rather than an 80286. The main difference, of course, is that the Olivetti M24SP is a desk-top machine rather than a portable.

Overall, what at first sight looks like rather strange positioning could turn out to be very clever. A company such as Compaq doesn't achieve turnover of more than $500,000,000 against IBM without making good machines based on sound marketing principles.

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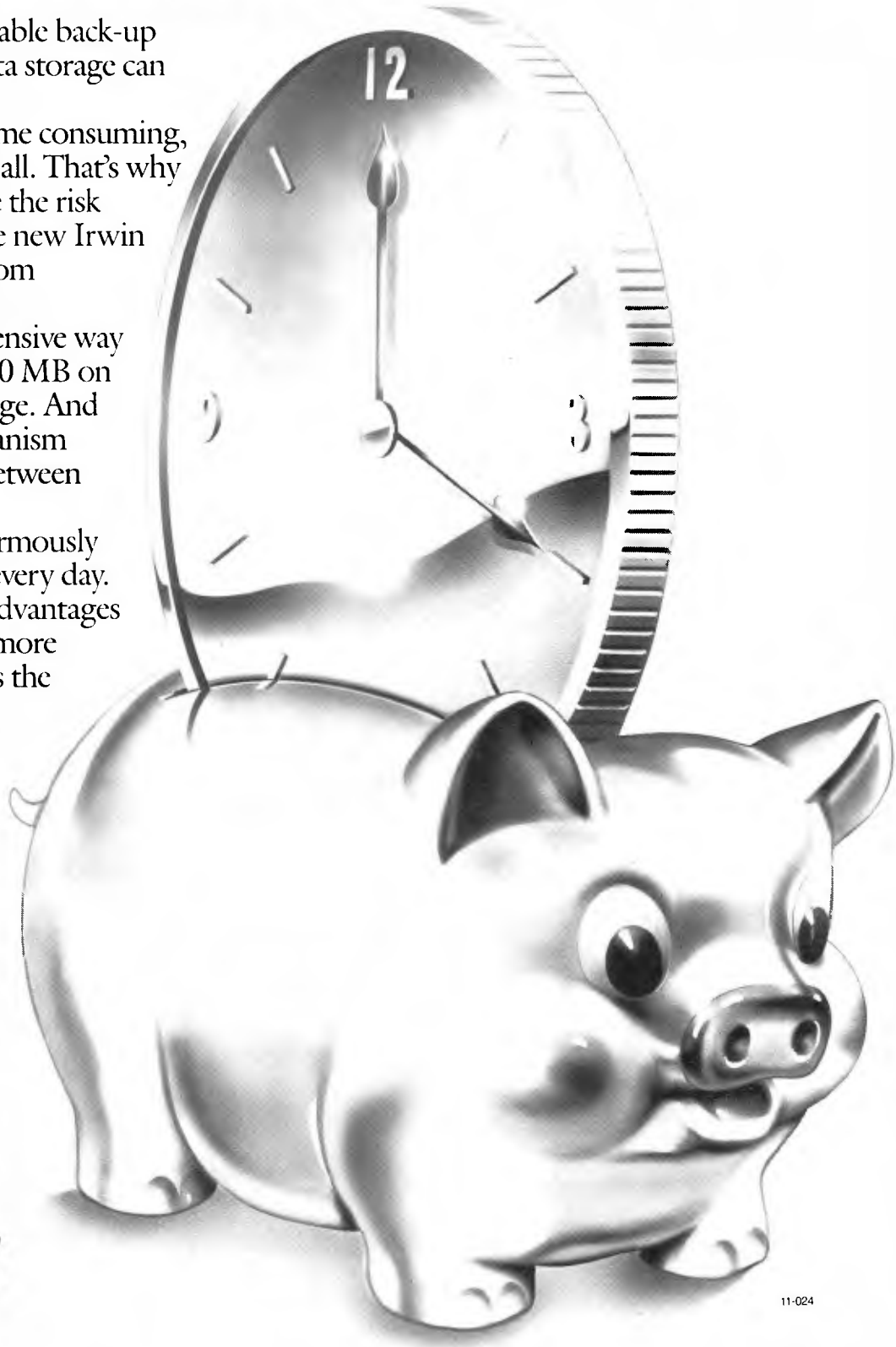

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The keyboard moulding is a strange-looking affair; the bottom is moulded flat so that it can act as the base of the machine when it's being carried around. Above this level, the moulding adopts a sloping wedge shape so that the keys are angled forward to give a better typing angle. This angle can be increased by flipping down two feet on the underside of the keyboard unit.

The keyboard layout is described by Compaq as 'AT-like'. I suppose this is true up to a point. Much of the keyboard is taken up by the qwerty typing section which is laid out in much the same way as the IBM PC/AT typing section. The '/' has been moved from between the Z and the Shift keys and there's a large, easy-to-find 'Return' key. The numeric keypad to the right of the typing section is also similar to that on the IBM PC/AT: it still has the combined functions of numeric keypad and cursor control/editing and it still houses the ESCape, Num Lock, Scroll Lock and Sys Req keys.

The main difference on the Portable II keyboard is that the 10 programmable function keys run along the top of the keyboard rather than down the left-hand side as they do on the IBM PC/AT. The main reason for Compaq doing this seems to have been lack of space. As the Portable II keyboard has to fit onto the front of the main unit, the extra width was not available to place the function keys to the left of the main typing section.

In use this is not much of a problem — it's becoming quite common practice among IBM-compatible manufacturers to place the function keys at the top of the keyboard. The only problem in this case is that there's no provision on the Portable II keyboard for a legend strip to mark the function keys. Although Compaq assure me that a special template is available to compensate.

The flimsy keyboard is permanently attached to the machine via a coiled cable

The final difference between the Portable II keyboard and the IBM PC/AT keyboard is that the Portable II has LEDs built into the Caps Lock, Num Lock and Scroll Lock keys which indicate when they have been activated. The IBM PC/AT has these LEDs in a separate area in the top right-hand corner of the keyboard. Wow, I bet that really excited you!

Overall, the keyboard is just as I expected it. The keys themselves have much the same feel as any other keytronics keyboard — light and rather dead, but perfectly usable. What worried me more was the keyboard's general construction. While I would expect a portable keyboard to be light in order to keep the weight down, the Portable II keyboard comes perilously close to being downright flimsy. It's quite possible to make the keyboard mouldings flex if you press them hard enough.

The front panel comprises the display and the disk drives

System software

As you might expect from a machine which uses an 80286 processor and professes to be an IBM PC/AT clone, the Portable II runs MS-DOS version 3.1. For those of you unfamiliar with the history of this operating system, it might be worth looking at it in a little more detail.

The standard operating system for IBM PCs and clones is MS-DOS version 2.2. When IBM launched the PC/AT, it was supplied with MS-DOS version 3. This was a rehashed version of MS-DOS version 2.1, rewritten to take advantage of some of the PC/AT's features. Soon after this version 3.1 was released. This is basically the same as version 3 with the addition of support for networking systems.

MS-DOS version 3 has not been without its problems. Its most basic shortcoming is that it forces the 80286 processor inside IBM PC/ATs and clones to behave as if it were a faster version of the 8088 or 8086 chip found inside the IBM PC and clones. This means that it's not possible to take advantage of some of the 80286's more advanced features.

More importantly, perhaps, it also means that MS-DOS version 3 cannot access more than 640k of RAM. This means that you could have a machine with one or two megabytes of RAM inside it, but the operating system would only see the first 640k.

It's possible to overcome this limitation in several ways. You could use the extra RAM as a RAM disk and use it to increase the speed of disk operations. Although this can be useful for some

applications, it still means that the extra RAM isn't available to applications programs.

The second solution is to use a product such as the AboveBoard. Certain software manufacturers such as Lotus and Ashton-Tate have got together to agree on a system which allows applications programs such as Lotus 1-2-3 to access more than 640k of RAM directly without having to rely on MS-DOS. This allows the user to access the full memory of his machine, but it does not bode well for future compatibility and it can hardly be described as an elegant solution to MS-DOS's RAM problem.

The second problem centres around the problems IBM-compatible manufacturers are having making their machines run MS-DOS version 3 and 3.1 while keeping them compatible with IBM.

As far as IBM PC/AT compatibility goes, Compaq has done a better job than most. The company has always put a great deal of effort into hardware and software compatibility with IBM products, and it has made sure that its implementation of MS-DOS version 3.1 works correctly.

The main problem here is that it's very difficult to test IBM PC/AT compatibility, simply because no-one has yet released any IBM PC/AT-specific software. This means that we are reduced to running programs which were originally designed for the IBM PC rather than the PC/AT.

As well as being supplied with the usual MS-DOS utilities, the Portable II was also supplied with some Compaq custom utilities and Compaq modified utilities.

The 'Mode' command is interesting. In addition to the normal Mode commands which you can use on an IBM, the Compaq version also allows you to set the Compaq display adaptor mode and alter the clock speed of the central processor, for example. Typing 'MODE SPE=COM' will slow the main processor down to 6MHz to give it compatibility with the processor speed in the IBM PC/AT. Typing 'MODE SPE=FAS' will take the clock speed back up to 8MHz.

Applications software

The review machine was supplied with some applications software already installed on the hard disk. This included IBM's writing and graphing assistant software and some very flashy graphics demo programs written in Microsoft Basic.

It never ceases to amaze me that manufacturers devote such a great deal of effort to producing pretty demo programs. In this case it was probably worth it, because the Compaq interpreted Basic programs were running at a speed that I would normally associate with compiled programs rather than bog-standard Basic.

In addition to the software supplied with the machine, I tried out the usual selection of applications software on the machine. This included Lotus 1-2-3 and Microsoft Windows which both ran with no problems at all.

I also tried a range of public domain games programs on the Portable II. Public domain programs are often a very good test of compatibility, as they tend to be written in a quick and dirty fashion and are intolerant of hardware incompatibility.

Just out of interest, I tried to run Microsoft Flight Simulator on the Portable II. I had no real hopes of it working because even the IBM PC/AT won't run it. I was totally amazed to find that Flight Simulator actually does run on the Portable II. I don't know how Compaq has achieved it, because it has managed to do something even IBM can't do.

As well as being supplied with MS-DOS version 3.1, the review machine was also supplied with Microsoft Basic version 3. This is not the place for a review of Basic 3's features, but it does seem to represent a marked improvement over GWBasic which is supplied with most other IBM compatibles.

When a file is accessed using the 'Open' command, it can now be 'Shared' — allowing other processes to read and write to the file; 'Lock Read' — which stops other processes from reading the file; and 'Lock Write' — which stops another process writing to the file. There is also a 'Lock Read Write' mode which stops both read and write operations from other processes and, finally, there is a compatibility mode which disables the locking process to allow old Microsoft Basic programs to run.

In addition to the facilities provided by the improved 'Open' command, Basic 3 also has a 'Lock' command which allows record locking as opposed to the file-locking provided by the 'Open' statement. This allows you to build a greater degree of flexibility into your programs and should allow you to produce true multi-user networked applications programs written in Basic.

In addition to its improved file-handling features, Microsoft Basic 3 also has a range of new and improved features in other areas. While I can't go into them here, *APC* should be doing a full review of Microsoft Basic 3 in the near future.

Documentation

The review machine was supplied with three manuals — one for MS-DOS version 3.1 and two for Basic version 3. Retail systems will be supplied with an owner's manual covering the set-up and care of the machine, but this was not available at the time of writing.

All three manuals supplied with the review system were spiral-bound in hard covers and were produced to a very high standard indeed. The text was properly typeset and presented in a logical, if somewhat technical, manner.

My one criticism is that the layout is quite bland with no use of colour. I appreciate that colour printing is expensive, but it would have helped to break up what were sometimes long tracts of boring text.

Prices

The Portable II will be available in three configurations: Model 1 retails for $6073 and has one 360k disk drive and 256k RAM.

Model II has two 360k disk drives and

Technical specifications

Processor:	Intel 80286 running at 6 or 8MHz
RAM:	Up to 640k on the motherboard. Up to 2.1 Mbytes using an IBM slot
ROM:	16k
Mass storage:	One 10Mbyte hard disk, one 360k IBM PC compatible floppy disk drive
Dimensions:	45cm(w) x 19cm(h) x 35cm(d)
Keyboard:	84-key IBM PC/AT-like layout
Display:	23cm green screen dual mode IBM monochrome/IBM colour graphics adaptor compatible
I/O:	Four IBM PC/IBM PC/AT compatible expansion slots. Two available to the user
Operating system:	MS-DOS version 3.1 (optional)

256k RAM. Model II costs $6415.

Model III has 640k RAM, one 360k disk drive and a 10Mbyte hard disk costs $8553.

MS-DOS version 3.1 and Microsoft Basic version 3 are not supplied with the machine but may be purchased as an option.

Conclusion

Rather against my better judgment, I ended up positively liking the Portable II. When I first saw it I let out a small sigh and exclaimed 'Oh, no, not another AT clone, and a portable at that!'

However, with the exception of Olivetti, Compaq is my favourite IBM clone manufacturer, and I should have known that the Portable II would probably be a notch or two above the rest of the pack.

Technically, the Portable II gives you more power than an IBM PC/AT and nearly as much power as a DeskPro 286 in a much smaller, neater package. However, one or two things lead me to think of it more as a very high-performance IBM PC/XT rather than as a straight AT clone.

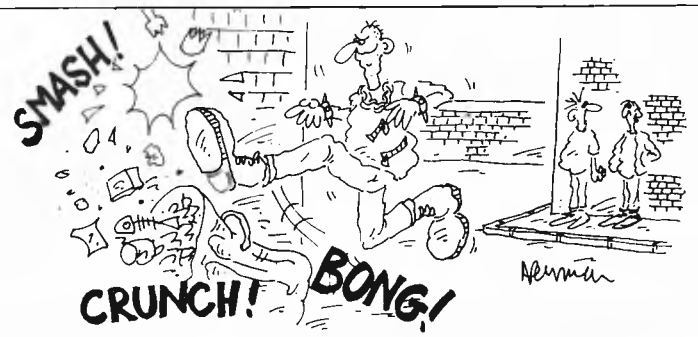
First off, the Portable II only has a 10Mbyte hard disk compared with 20Mbytes for most AT clones. Also it only has a 360k floppy disk drive, compared with the 1.2Mbyte drives fitted to most other AT clones including Compaq's own Portable 286. Finally, the Portable II only has two spare expansion slots which is far fewer than most AT clones. There is nothing wrong with this; in fact, for many people this will be a positive advantage — there is no point in paying for features you don't want.

All in all, if you want more power than an IBM PC/XT can provide (which isn't difficult), but you don't want all the unnecessary bits and pieces in an IBM PC/AT or clone, then the Compaq Portable II could be the one for you. END

Benchmarks

BM1	0.5
BM2	1.5
BM3	3.1
BM4	3.2
BM5	3.5
BM6	6.1
BM7	9.4
BM8	9.6
Average	4.61

All timings in seconds. For a full listing of the Benchmark programs, see End Zone.



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Trespassers will be prosecuted

In a brave attempt to combat the evil deeds of hackers and pirates, the computer security business has spawned some interesting, and supposedly foolproof, protection devices. Wendie Pearson and Jan Smith break them down.

In the never-ending fight against hackers, pirates, or anyone else trying to invade your system, computer security is big business.

Everywhere, devices are springing up for the protection of hardware, software, computer rooms and data. Increasingly sophisticated devices are appearing on the software front, while some companies have set up shop to fight the physical removal of equipment.

Two security measures which have been around for some time are *data encryption* and the use of *dongles*, neither of which are often explained.

Data encryption works by encoding a message which you need to protect, which is then decoded at the receiving end. The encoding is done via a particular program designed for the purpose.

Single-key encryption is the normal method used, although it is fraught with complications, as the sender and the receiver use the same key.

In a large network, the problem of managing these keys is enormous — a large electronic fund transfer network linking 100,000 terminals to approximately 100 banks would use 10 million individual keys, all of which would have to be changed frequently, according to researchers.

Experts, therefore, see public key encryption as the answer to computer security. The fact that this uses two keys — one for encryption and a second for decryption, means that the two keys form a unique combination, so the author of the message must always be who he says he is.

The idea is that once a message has been encoded, neither the sender nor an eavesdropper will be able to decipher it: messages can only be decoded by the second key, held by its owner. Although slower than single-key encryption, lack of speed is compensated for by the apparent security of the system.

The public key system means that the public directory need not be kept under tight security, and can be referred to whenever the caller needs to send a private message over a public data network using his own private key.

Encryption

One Australian bank which is using public (dual) key encryption is the ANZ. In Sydney, there are encryption devices for all overseas lines at OTC in Paddington. For ANZ's internal networks, such as ATMs, EFTPOS and actual branches, there is a basic encryption pad built into the terminals. These can be changed only by two people using their respective keys, at different locations.

For security reasons, Westpac did not want to comment about its encryption procedures. "Standards for the industry are still being negotiated," a spokesman says.

The principles of public key encryption were first worked out in 1975 by Whitfield Diffie and Martin E Hallman, electrical engineers at Stanford University, Connecticut, and the first practical implementation was developed in 1977 by Ronndal R Rivest, Adi Shamir and Leonard Adleman, computer scientists at the Massachusetts Institute of Technology.

Ran Data Corporation, through its distributor Netmap Corporation, offers a full range of encryption devices and claims to have 95 per cent of the Australian market in line-bracketing devices. "Netmap offers protection anywhere there's a shared line, through encoding and decoding on things like Telex, FAX and ATMs," says John Brothers, Netmap's Director of Marketing.

Netmap also specialises in voice recognition equipment and is launching a new $999 package for IBM. But although voice recognition appeals to employers worried about RSI claims, Brothers believes that the real peril is still the hacker, to whose depradations too many big companies are turning a blind eye.

"There's some who are still putting top secret information into an envelope and giving it to a courier, or an office junior, to deliver," he says, horrified. "There's too much apathy about security, which is crazy when today the amount of shared communication exceeds the total voice communication. More data is travelling down lines than there are people talking on telephones," he says.

Ran Data's algorithm system means that a key can change up to 40 times every second, depending on the line speed, which means that it can take up to 43 years for a key to duplicate a number

on a typical 2,400 bps link. "It's the closest thing there is to an uncrackable system, and is well ahead of America's Data Encryption Standard," says Brothers.

Ran Data encryptors are used by the major banks, building societies, police forces, government agencies and industry. But Netmap believes there's not nearly enough, all the same. "With almost 400,000 terminals in use, and more than a quarter of a million PCs — which just need a modem — there are at least 600,000 devices in Australia capable of contacting mainframe computers," says Brothers. In other words, a point of entry for a hacker.

"Manipulation of databases costs millions in the US and here, but only the tip of the iceberg is reported, because of the embarrassment," says Brothers, who has a favourite story about a major bank which refused to believe that a bright high school student with a random number generator had created a $16,000 account for himself.

The news that hackers have doctored records of driving offences at a UK motor registry doesn't surprise Netmap. "Wait till it's the TAB," says Brothers, who also notes the ability of the malevolent hacker to put "computer viruses", or miniprograms, into a network so the whole program corrupts and goes into an endless loop.

Another major computer security firm is Datacraft Australia Pty Ltd, the largest Australian manufacturer of modems, who also market EFTPOS terminals and card issuant systems for banks.

The card issuant systems, from Atalla Corporation of San Jose, California, have been on the market for about a year and will soon be installed in a major Australian bank as part of Datacraft's network security system.

Chris Drew, Datacraft's marketing manager, EFT Products, explains that although some financial institutions use the dual key encryption system, Datacraft doesn't think it's the answer.

"The dual key system, or link encryption, which decrypts data at the other end assumes that the only dishonest people are outside the banking system," says Drew. But it's pretty obvious that a hacker would find it much easier, not to say more comfortable, to infiltrate a bank's DP department to do his dirty work, rather than crouch in a hole under the street somewhere."

'Manipulation of databases costs millions in the US and here, but only the tip of the iceberg is reported, because of the embarrassment...'

With the Datacraft/Atalla system, there is no decrypting. "Your PIN can be verified at the ATM or transmitted to the host computer, without the bank needing to know your PIN at all," says Drew. This is because the information necessary for verification is built into the magnetic strip on the card, so that it can be triggered by the PIN — but the PIN cannot be generated by the information.

The card issuant system is a further safeguard. "It enables a customer to walk into the bank and change the PIN on request," Drew explains. "All the system does is check the 16 figure account number, which is an error-prone process otherwise, and other verification data. The bank never knows your PIN."

This, says Drew, makes life easy for people with multiple cards with different PINs, who want one all-purpose card, or who have been unlucky enough to have other members of their household discovering their PINs.

When it comes to PCs and software, one solution popular overseas, though relatively unknown in Australia, is the dongle.

Dongles

Basically a small piece of hardware, a dongle is usually comprised of a chip inside a cartridge which is encased in black plastic. This sits on the back of a micro, decked out in its black plastic mac, and without its presence you can't run the software that comes with it. The software contains a recorded program which checks to see if the dongle is present, so each package is sold with a different dongle.

When the program is run, it tries to read the dongle, and if this isn't found, it bombs out the program and produces a message on the screen stating the obvious — that is, that you are using an illicit copy.

Using a dongle means that although you can copy a disk as many times as you like, the copies won't run unless they can find this dongle. Anyone running the program must have the same micro, disk and dongle that you have.

Otherwise known as 'a clumsy way of protecting software houses', the dongle is made by the software author, who

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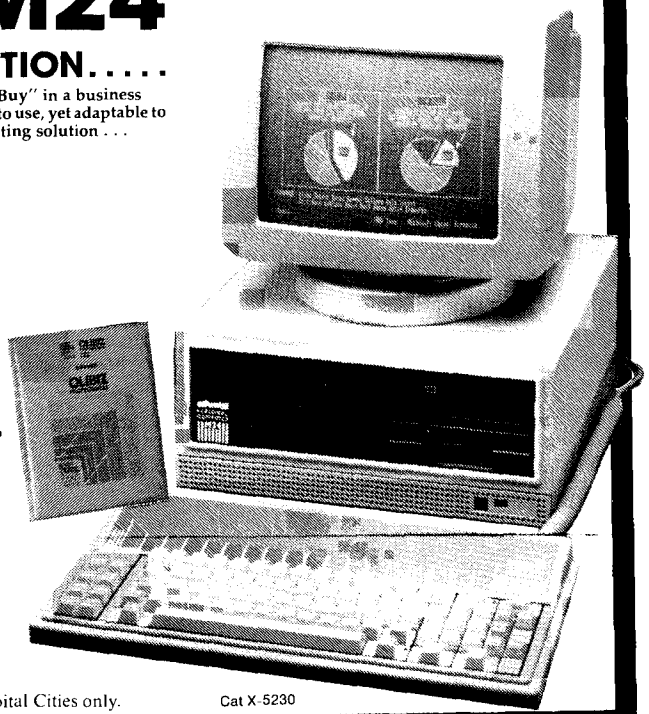

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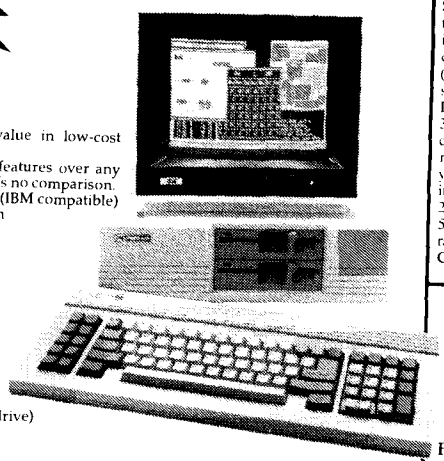

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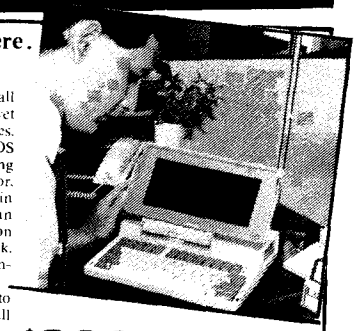

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writes into the software the program that detects this object. Before you could proceed, you would have to break into the program and get rid of the part that detects the dongle. How it got its rather bizarre name is anyone's guess. Ask any software house whether it uses dongles and it will reply: 'What's *that*?'

Eracom Pty Ltd is an Australian company which develops, manufactures and sells cryptographic equipment, or data scramblers. "We're not into dongles," says Dr Bill Caelli, Eracom's technical director at its Burleigh Heads, Queensland, branch. "People get sick of them and forget they have to use a different detector for each dongled program."

At PC level, says Dr Caelli, security provisions are best if built into the machine itself. "For the mum-and-dad user, as opposed to the icon and window freak, a security device needs to be transparent and painless."

If you are using an IBM PC, Eracom can provide an add-on card for the machine which will scramble all the information on the diskette. It is locked into the operating system and can only run on that particular machine. "Because it is transparent (the user doesn't know the card is on the machine), it removes the temptation to steal it," says Dr Caelli.

These devices encrypt all stored data on hard and floppy disks and cost about $1,000.

Eracom also does line encryption security. A spokeswoman for Eracom says: "You can either encrypt everything, or encrypt intelligently, for instance, on a circuit to Austpac, where the solution would be to encrypt just the user data and leave the protocol unencrypted. Here, we use a processor chip in a small box which is plugged into the communication lines between the modem and the computer. There is one of these boxes at each end of the communication line, to intercept data.

As well, Eracom provides security for ATMs and EFTPOS, for banks and building societies. Here, the PINs are sent via the institution's primary computer to a device which authenticates the PIN and sends the request back to the computer.

Eracom claims it is the only company producing this kind of module in Australia. It is used by Westpac, Commonwealth Bank, State Bank of NSW, ANZ, St George Building Society, State Bank of NSW, Department of Defence, credit unions, Austnet and offshore banks like Citibank Hong Kong. It is a fairly infant field in Australia.

Eracom, however, does not manufacture anything to prevent illicit copying of software.

For this, companies like Ashton Tate and Lotus use Softguard Systems, a California based company. "Most copy protection is software based," says Bill Bolton, MD of Ashton Tate. "It is built into our software in the US and all we do in Australia is maintenance.

"We used to use Prolok, but we got a lot of flack from our customers," he says.

Softguard Systems also manufacture an encryption device called Superlock. This produces deliberate disk errors, but the program is written to take account of these and to ignore them when they occur.

Prolok is one of the most commonly used software protection systems in Australia. "It's almost a generic term for copy protection," says Ross Macarthur, MD of Communications Control, Prolok's distributors. "But making claims in the software security business is a bit like saying the Titanic is unsinkable.

"The major threat to the software industry is the casual, not the professional, copier," says Macarthur,

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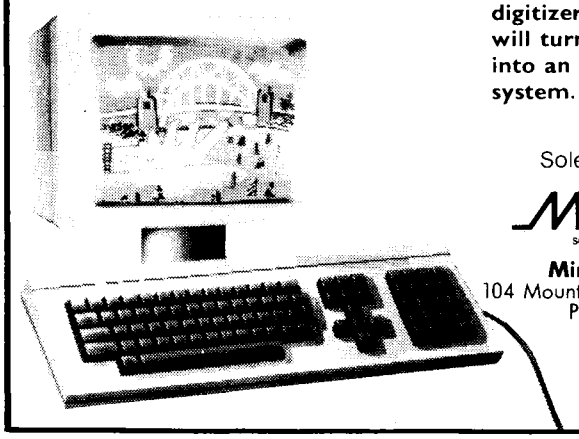

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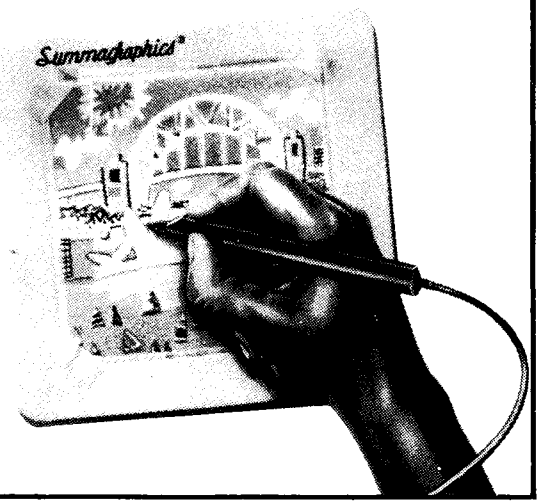

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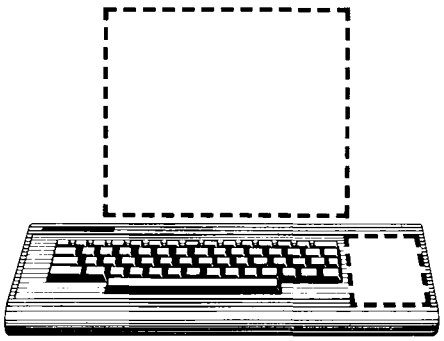

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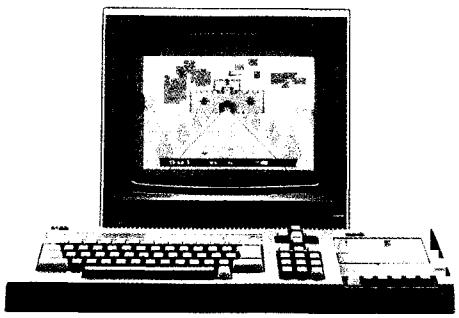

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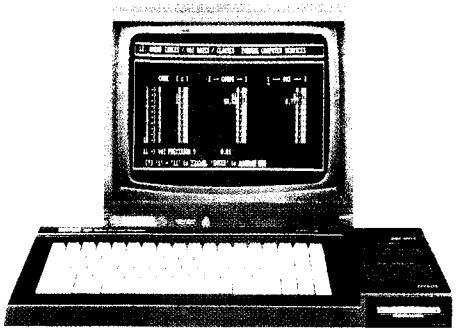

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who believes there is nothing available commercially to crack Prolok's latest system, although there have been some problems with earlier versions.

Prolok in the US has taken out a $120 million injunction against Quaid, who had been distributing a pirating program capable of cracking a number of security systems. Macarthur believes that if Prolok wins its case, now before a Louisiana court, selling such security-breaching programs will become a criminal offence.

Prolok was invented by Krag Brotby, a Norwegian-American who became incensed when one of his own programs was violated. Ashton Tate owns 15 per cent.

The new version has two enhancements. It has two laser imprints on the oxide surface of the floppy disk, each with its own distinctive characteristics. This difference is recorded on the encryption program, which checks to see if they are in place. If not, the program will not run. The second refinement is a 40k encryption program copied onto the disk which merges with, and encrypts, the data.

Earlier Prolok versions needed the original system disk to be in Drive A when booting up from hard disk copy. The new versions of Prolok allow a protected program to be copied onto the hard disk, which can thereafter be booted from the hard disk without the need for the original Prolok system disk to be in Drive A.

Macarthur believes that the new Prolok therefore overcomes earlier objections from users that it was too fiddly.

Communications Control also distributes Filelok, which does for data what Prolok does for applications software. Macarthur explains: "By using the Filelok disk in Drive A, the data on hard disk is encrypted and can only be decrypted by using the same disk and the password, which is encrypted onto the data and is not accessible. The user selects his own password for each file."

Clive Rainbow, principal of Computer Brokers, has used Prolok for two years and has no worries. "Illegal devices called Prolok crackers are certainly available in Australia, which break the code. Nobody has been caught yet although it would be fairly easy, because the game would be up the moment they needed a service call, and there would always be the risk of someone dobbing you in."

Once sued in an Australian court, says Rainbow, instant retribution would follow, namely bankruptcy. "If ever I have to sue, I've promised to pay half my winnings to the informer," says Rainbow.

Computer Brokers supply Sales & Marketing Management (SAMM) software, created by Rainbow and launched in 1985, to clients who include Chase AMP and Medibank. Rainbow says research shows that for every software program, there are 12 copies made illegally.

MicroPro, manufacturer of WordStar, estimates there are four illicit clones for every original. The company has attacked the piracy problem by issuing an amnesty so that any users with an illicit copy can register with MicroPro for $46.

'... MicroPro, manufacturer of WordStar, estimates there are four illicit clones for every original.'

MicroPro then puts a proper serial number on the disk so the user can upgrade it at his local dealer — something which wasn't possible for him before.

Originally, WordStar 2000 was copy protected, but MicroPro withdrew it because it was causing installation problems on certain machines. As with many commercial packages, users could make three copies of the program, which would record how many times it was copied.

Writing encryption programs requires highly specialised knowledge, such as you might get in a mathematician who is also experienced in security and programming.

Fast loading & disk copying

Fast loading is a method employed by many games software houses to protect goods. Fast loaders scramble signals. "When you load a tape, it's a rewrite of what is stored in ROM," said one software development manager. "It makes a new version of the ROM in the computer's RAM, so the new fast-loaded version enables the RAM version to be written much faster." Fast loaders do to signals what drinking a yard of gin would do to an average human being.

Some people run into trouble with disk-copying programs when the micro wipes out all their precious data. One hacker explained that if a disk-copying program finds an error on disk, it will ignore that whole section of the disk — meaning that you have an incomplete second disk. Meanwhile, it thinks it has copied the whole program, but it hasn't. What happens next is great fun. All the data disappears, as the program knows that if a particular section is erased, you have the wrong copy.

Software houses specialising in games have developed a number of defences. Ozi Soft, in Sydney, has developed a short machine code routine which goes in front of games like Rambo and Goonies and checks for crosses (errors), which have been inserted in the program. If they're not found, the game won't run. The X, of course, is uncopyable.

In theory, as Kevin Bermeister, MD of Ozi Soft, says: "There are some awfully smart kids out there, so we fight this by developing new routines, hoping to prevent them from getting around the X, or taking the X-checker out."

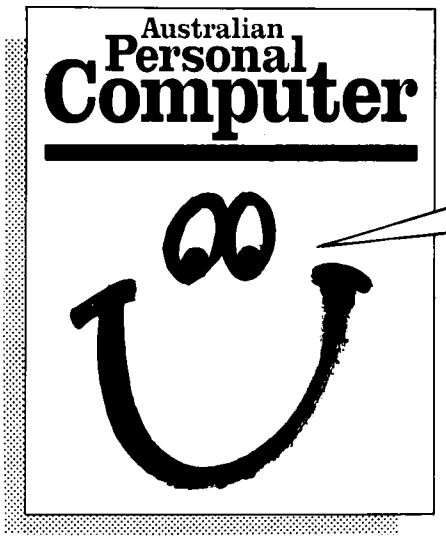
Ozi Soft also puts the X routine into education software in programs like Fisher Price's Hopalong Counting and Body Transparent, an Encyclopedia Britannica program. "It's similar to the Prolok principle, and similarly we have a constant battle," says Bermeister. In his view, the best defence against kids is public education. "The sort of thing you get on video cassettes, where the message has got through fairly well. Parents often aren't aware that it is illegal to copy software, so until then, we're going to need the three fulltime programmers we have to make it tricky."

Bermeister finds dongles too expensive for games, and notes that even dongles are not 100 per cent secure.

Unlike most games and educational software distributors, whose products have security built in overseas, Ozi Soft manufactures enough software to make security insertions viable.

Protection

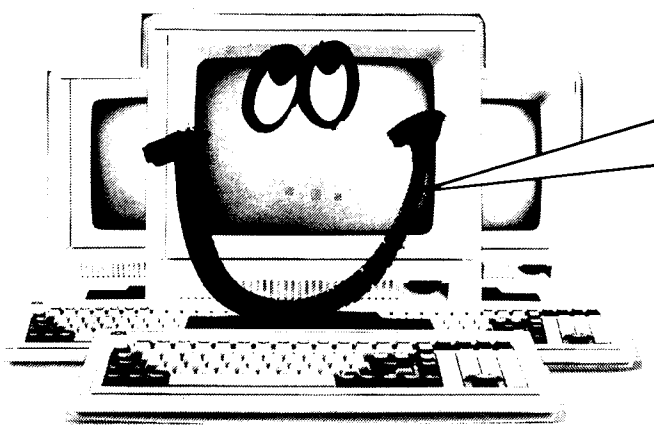
Meanwhile, the actual physical security of hardware is also being enhanced by technological means. In 1983, the London Metropolitan Police launched a property-marking scheme to aid the return of stolen property as a means of proving ownership. The system means grafting your postcode onto your goods, with your house number following on; for example, if you live at 3 Apple Tree Lane and your postcode is PSA 1AA, the system number would be PSA 1AA3. If you move or sell the goods, you simply add a cross to the old number and insert the new one, using a panel pin or marker.



"The system performs well."

"One of the best I've seen."

"Undeniably high quality."



Thanks.

In a recent Benchtest article, Australian Personal Computer took a close look at ICL's small business computer, Quattro.

It marvelled at how Quattro allows up to six people, sitting in their own offices, to work independently at their own ICL, each working on up to six different tasks.

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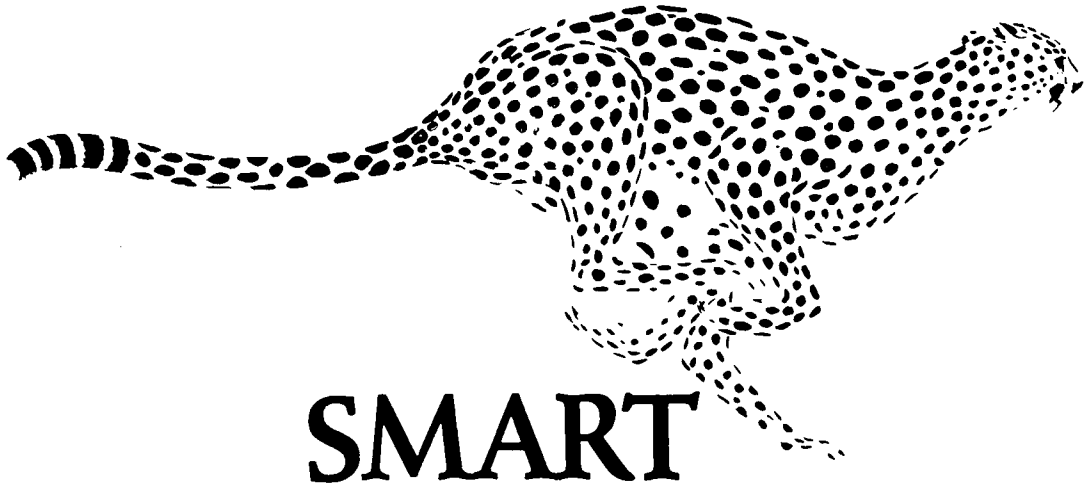

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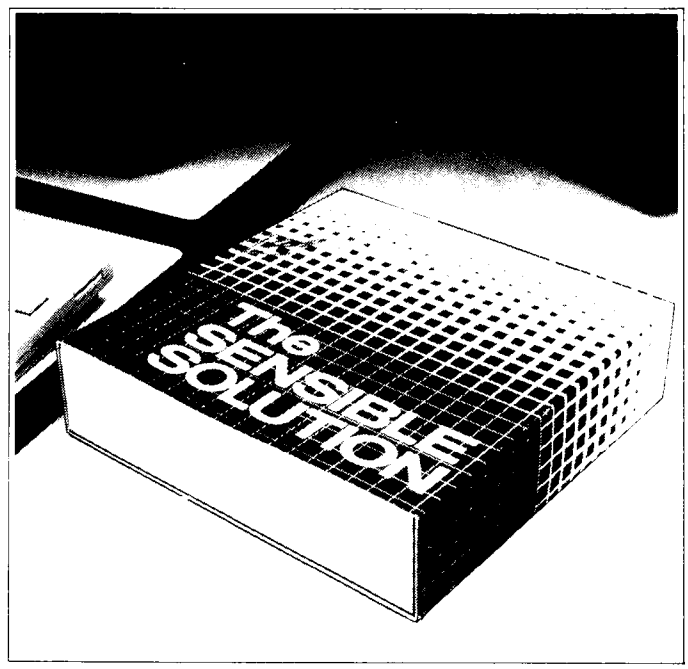

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- ☐Plain English programs
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The FBI is also leaving its mark. Fingerprint analysis combined with a personal ID number makes up a fingerprint analysis system being evaluated at FBI Headquarters in Washington DC. Designed to restrict physical access to computers and cashpoint machines, the Model IDX-10 biometric security system provides electronic fingerprint identification and is made by Identix Inc of Los Altos, California. It consists of a central microprocessor and at least one 'personal verification' terminal. Users have to insert a finger into the PVT scanning bay so that the print can be photographed, and the result is then associated with the appropriate PIN and stored in the unit's memory. All this takes one minute.

When you come to use this unit, prompts on the LCD screen instruct you to enter your PIN and insert a finger into the bay. The unit takes seven seconds to figure out if you are who you should be, and verification then appears onscreen.

Anyone inserting someone else's finger for a laugh will be met with a ghastly noise, according to Identix, as well as a message on the screen telling you to cut it out (the fooling around, not the finger). Don Wald, vice president of engineering for Identix, says the system can lock an adjacent door (one way of keeping staff in the office), log the time of attempted entry and store the culprit's fingerprint for future ID. The system is based on a Motorola 68000 chip, 512k RAM, an 11Mbyte hard disk and back-up floppy, and up to 60 terminals can be linked to each computer.

A recent study by market research firm *Frost & Sullivan* in the US noted that information security products will be worth over $1.5 billion in 1989, more than doubling 1985's figure of $741.13 million. Computer security is expected to account for nearly 95 per cent of all information security revenue there. Another US market research company, International Resource Development Inc, estimates that the amount spent on data communication and encryption products will hit US$121m in 1987.

Computer crime is considered a national crisis in the US, and Futurex Inc, a company specialising in security systems for banks, government agencies and insurance companies, suggests that serious, embarrassing crimes committed against large financial institutions are not publicised as no-one is going to want to admit to them and risk losing their credibility. But perhaps if the companies involved could overcome their pride, they might get together to organise a solution.

Many millions of dollars are said to have been lost, and firms often don't prosecute because of fear of embarrassing publicity. A survey by the American Bar Association on computer-aided crime found that about half the respondents had suffered from crime of this sort in the past year. Of these, one third didn't report the crime, and 39 per cent reported the crime but didn't identify any suspects.

Final thought

It has been said of the whole area of security, "you can never come up with something totally foolproof because people are adaptable and very clever, much more so than machines, and will always come up with a way of cracking something." END

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Tune into the wireless

Robin Mudge and David Furst look at the way in which the micro has changed the design of the radio receiver and made short wave listening a much more approachable activity. Part Two next month.

Contrary to popular belief, the information revolution didn't start with the coming of the microprocessor, but with the transmission of the first transatlantic radio message by Guglielmo Marconi, way back at the beginning of the twentieth century.

Now, almost every country of the world transmits its voice by radio waves. Every year the number of nations becoming involved in radio broadcasting increases dramatically. Programmes range from political propaganda, through popular entertainment, information and news; their places on the radio dial and transmission schedules are published each year in large tomes like the *World Radio* and *TV Handbook* and the *Guide to Utility Stations*.

Whereas the microprocessor didn't start this revolution, it has certainly made Short Wave Radio Listening more accessible to the ordinary person. The radios, or more correctly receivers, have been reduced in size from those giant dishwasher-size receivers found in government surplus stores, to small portables with the power to pull in signals from all corners of the globe.

The control of them has been simplifed and extended to a point where even the strange blips and blops of morse and radio telegraphy can be easily decoded and printed onto paper. So, for those of you who can put up with less then hi-fi sound quality and a lack of pictures, the short wave radio can provide an intriguing source of information, without having to connect your micro to the telephone.

History

Short Wave Listening, or SWL in radio jargon, was very popular in the 1920s-30s and the war years. Indeed, there were almost as many radio magazines then as there are computer magazines now. During the war, radio carried all sorts of information, and the public soon became quite adept at tuning into stations from different parts of the world, hoping to pick up hot news. Government agencies were particularly keen on monitoring the short waves; clandestine messages and other secret codes made up a substantial proportion of the transmissions.

In fact radio became a substantial psychological weapon. Sefton Dellmar ran a British radio station that pretended to be one of German military origin. Radio Atlanta, broadcast to the German U-boat service, was picked up by a huge German civilian audience. Later this station, transmitting from a hugely powerful transmitter on the south coast, imitated the ordinary civilian stations with some pretty devastating results.

The hobby lost popularity for a while, but recently it has become more popular again, along with people's increased interest in world events. This trend has led Sony and others to bring out a new range of portable radios which offer many of the facilities found on proper short wave receivers.

Before discussing these new radios though, what is so special about these short waves and what do they carry? It's got a lot to do with the way that radio waves travel through space: radio propagation. A radio waves path is affected by the weather, the season, the sun's activity and the time of day: it's a wonder that they get anywhere at all! Some of the waves hug the surface of the earth and can travel fairly long distances; these are called ground waves. Others travel upward — sky waves — and eventually encounter the outer atmosphere, where they can be reflected back to earth by layers of electrically-charged particles called the ionosphere. These waves often bounce back and forth many times and in the process travel from one side of the earth to the other.

Both ground waves and sky waves offer useful features for getting messages about the place. Whether a radio signal travels as a ground wave or a sky wave is mainly dictated by its frequency, the low frequencies being ground waves and the high, sky waves.

Theory

On to the theory. All radio waves, in common with all other electromagnetic radiation (radio, heat, light, x-rays and gamma rays), have a frequency and wavelength, both of which are immutably linked by the simple formula:

$$\text{Frequency} = \frac{\text{The speed of light}}{\text{Wavelength}}$$

The speed of light (and radio waves) is 299820 kilometres per second.

The best way to think of radio waves is to think of waves in the sea, edge on. These waves have a series of peaks and troughs; the distance between successive peaks or troughs is the wave's length, and as the wave moves, its frequency is the number of wavelengths that pass a fixed point in one second. The wavelengths in which we are interested range from 6000 metres to 10 metres in length — that's a frequency of 50KHz (kilo meaning a thousand and Hz meaning frequency

Radio Verena

measured in cycles a second) and 30MHz (mega meaning million).

The frequencies that most good short wave radios can tune into are separated into three broad bands. Very Low Frequencies (VLF — Long Waves in Old English) stretch from 10KHz to 540KHz. These frequencies carry morse code and radio teletype, weather reports and other utility messages. Medium Frequencies (MF), or Medium Waves, stretch from 540KHz to 1600KHz (1.6MHz) and carry the domestic radio transmissions with which we are all familiar. Then come the ubiquitous short waves, or more correctly High Frequency (HF), stretching from 1.6MHz to 30MHz. It's this huge range of frequencies in which the short wave listener is most interested. They carry an enormous range of information ranging from clandestine and underground groups, ship-to-shore telephone, weather reports and a whole wealth of foreign radio stations like the *Voice of America* and *Radio Moscow*, beaming their thoughts and interpretations of world events as far as the prevailing propagation conditions will allow. On the short wave the world is literally at your fingertips. There are plenty of books listing what is transmitted where, and when; right across the entire frequency range from 50KHz to 30MHz. The times of transmissions are given in UTC (Universal Time Coordinated) which is, as near to making no difference, Greenwich Mean Time.

Mixed up with all these stations are the radio amateurs, more usually called 'Hams'. The Short Wave Listener (SWL) is not necessarily a Ham; Hams have to pass an exam testing their knowledge and practical ability in all things to do with the technology of radio before they are licensed to transmit radio messages. The exam, the AOCP (Amateur Operators Certificate of Proficiency) is controlled by the Department of Communications which also makes sure that the Radio Communications Act is put into practice. This Act relates to SWL as well. It's strictly forbidden to pass on any overheard information to a third party. This is understandable: imagine you accidentally tuned into a ship-to-shore telephone conversation between two business colleagues, you might well hear some information which might be of value to a business competitor; without the protection of the Radio Communications Act (and the Secrecy Act), the consequences are obvious.

Requirements

Back to the short wave receiver; what do you need to become a short wave listener? This depends on how seriously you want to pursue the hobby. If you are only interested in picking up strong signals from transmitters in the larger countries on a very casual basis, or if you travel extensively and wish to stay in contact with the hourly news bulletins from Radio Australia then one of the new range of small portable radios is for you, costing between $100-$350. One thing to watch for with these cheaper radios: much as they may have up to 9 bands, many of them miss out on large parts of the spectrum. Make sure that yours covers 550KHz to 20 or 30MHz with no gaps or that it does cover the bands you're interested in.

If you are more serious and want to capture signals from the most remote of locations (DXing in radio terms), then a more sophisticated receiver will be needed, costing anywhere between $800-$1200. These receivers are more sensitive, selective and stable than the smaller portables. This means that they can capture weaker, more distant signals and sort them out from the morass of surrounding ones. Having done that they can stay in tune without drifting slowly away from the station over long periods of time.

To be a proper communications receiver, the radio must have a number of essential features. The most important is the ability to receive signals transmitted using a number of different modulation techniques. (This is the way in which sound or digital information is superimposed on the radio wave, which then carries it to its destination — the carrier wave). The most common are Amplitude Modulation (AM), Frequency Modulation (FM), Single-Side Band (SSB) and Carrier Wave only (CW). Both AM and FM use up quite a lot of radio space. SSB and CW use much less and so are used by amateurs in order to cram as many signals as they can into the narrow frequency bands allocated to them. Due to their efficient use of radio space, SSB and CW are also beginning to find favour in some commercial applications.

Listening to an SSB or CW signal on AM is impossible, so if you want to hear the amateurs, the set you choose must be able to decode them. Other useful features to look for are special filters to make the SSB and CW clearer by eliminating interference, and controls that effect the rate and finesse to which you can tune the set. The best place from which to buy a receiver is an amateur radio supplier rather than an ordinary hi-fi dealer.

Next comes an antenna, or aerial. The portables come with their own telescopic short whip antenna but for more serious listening and better results a more substantial one will be necessary. The simplest is a 'long wire antenna', which is just that, a long wire; the longer the better. It can be suspended from the roof to some other convenient point, either horizontally or down the side of the house. A feeder cable is then connected to it which leads into the house where it is plugged into the receiver. There are many commercial antennae around, many of which are very large and highly directional. The directional ones are much more sensitive to weak signals than a long wire, but they have to be mounted on a rotating device so that they can be pointed in the direction from where the signal is expected.

A useful and compact type is the Active Antenna. This contains active components which amplify the weak signals before they get to the receiver. They are a reasonable alternative if a larger wire antenna is not possible. They are available from Dick Smith and others. They cost about $90.

Whether you choose a portable or a larger communications receiver, the design of the receiver will have been radically affected by the microprocessor. Its introduction brought about two broad changes: size and flexibility. The tuning range of these receivers is vast, from 10KHz in some cases, to 30MHz. In older sets the bit that does the tuning looks rather like a set of bacon slicers (the variable capacitor). It took up a lot of space and was badly affected by temperature changes and physical knocks. This has been replaced by a special computer-controlled tuning synthesiser which is unaffected by temperature and knocks and is an order of magnitude smaller. The miniscule Sony ICF-7600D is testimony to this; it measures only 12cm X 18cm X 3cm and is very light. It tunes from 153KHz to 19.999MHz in 5KHz steps and costs about $349. Dick Smith sells the Sangean ATS803 which is similar, and also bears looking at. It sells for $329.

The flexibility has increased enormously with the control possibilities offered by the microprocessor. They include: direct entry of the frequency from a keyboard; memories to store known stations; the ability to automatically switch between stored stations searching for active ones; and so on. All these are included in the smaller short wave receivers from Sony and others.

The larger ones offer this and more. The Japanese manufacturers Icom and Yaesu produce receivers in the $800-$1200 range which can be connected to an external microcomputer by their built-in parallel or RS232 interface. JRC

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has the NRD-515 and NRD-525 which are real performers, but at over $2000 you'd have to be enthusiastic! Some software is available for popular micros which will turn the receiver/computer combination into a very versatile scanning receiver. Check the availability of software when considering the purchase of such receivers. You may prefer to write your own to really make the receiver 'sing and dance'.

The scanning receiver lets you enter large numbers of station frequencies, identification notes and receiver control information into a memory bank. These can then be scanned automatically with the receiver stopping at any of them which start transmitting and recording the results on an audio tape recorder.

If you don't know what specific frequencies to listen out for, then the system will search all those between the present upper and lower limit. Each package offers many variations on this theme, but the overall advantage of this combination is that you don't have to sit by the receiver all the time — you can go off and do other things and come back later to listen to the tape. You can also take advantage of the diurnal variation in the propagation conditions by letting the system search for stations transmitting on frequencies that are active while you're out of the house.

Most microcomputers transmit a great deal of radio 'hash'. This can badly interfer with the communication receiver and the micro's case usually has to be screened. Many micros are manufactured with screening inbuilt.

For people more interested in using the radio as a scanning receiver and not wanting to tie their micro up to it, there is a very good dedicated micro controller for the Icom and JRC range of receivers. Called the Pocom PFC-100, it's Swiss-made. Unfortunately this unit is difficult to find in Australia. The Pocom is an intelligent programmable frequency controller. It's built into a well designed plastic-covered metal case measuring 282 × 67 × 220mm and weighs 2.4kg. On the front is an array of push button keys that control all its functions, and a liquid crystal display that shows what's happening. Once the unit is connected to the receiver's interface with just one cable, it's ready for action.

All the receiver's functions can be controlled from the keyboard directly. There are one hundred memories which can store the station's frequency, the text describing it, the reception mode (AM, SSB, CW, FM) and, on the JRC NRD-515, even the bandwidth, automatic gain control and attenuator can be set. There are also six 12-volt switchable outputs (for turning on different accessories) which can be set in any combination on any memory location.

All one hundred memories can be continuously scanned and individual dwell (pause) times for each set. They can be split into groups of 10, and then each group scanned at different times using the system's versatile clock. This is a useful feature, especially for listening to groups of stations with a common interest. There's also a special 'wobbler' mode which causes the receiver to continually tune either side of a station's expected transmission frequency by any selectable amount. This covers the possibility of the station transmitting off frequency slightly and, therefore, under normal fixed modes, being lost.

The controller will search between any two frequencies in any tuning steps at a variety of speeds. The set can, of course, be used manually, but has the advantage of being able to store all of its settings when an interesting station is found, at the touch of a button.

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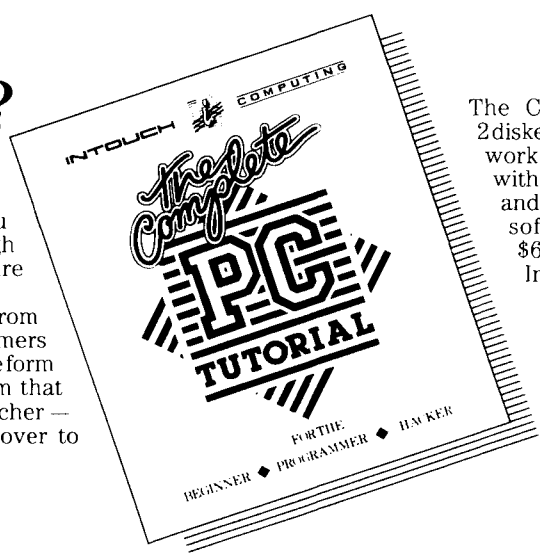

The Complete PC Tutorial comprises 2 diskettes and operates with an IBM-PC or work-alike running PC-DOS or MS-DOS with 128K RAM or better. It's unprotected and available from most software outlets at $69.95 or direct from Intouch Computing.

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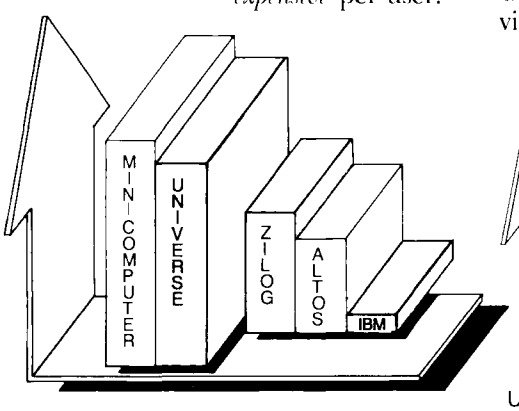

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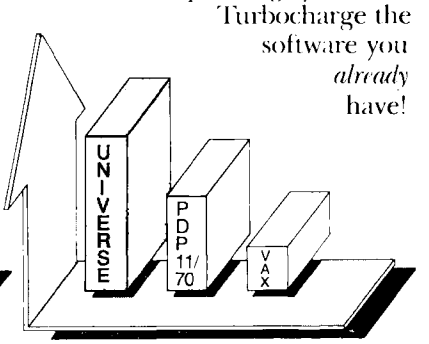

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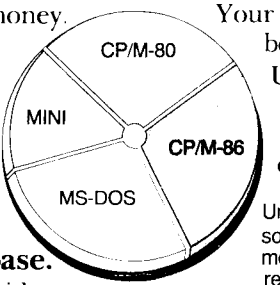

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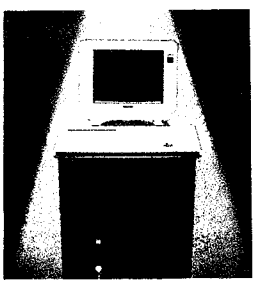
Benchmark

The benchtest used was provided by BYTE magazine and is the Sieve of Erastosthenes prime-number program (10 iterations). Note that all performance is for a single user system only.

COMPUTER	PROCESSOR	OPERATING SYSTEM	LANG.	TIME (sec.)
AED UNIVERSE	80286/8	MP/M 8/16	C (D.R.I.)	1.8
ZILOG	Z8000	ZILOG	C	4.0
DATAMAX	80186	C-DOS	C (D.R.)	4.3
WICAT	68000	UNIX	C	4.7
ALTOS	8086	XENIX	C	6.0
LABTAM	8086	MC-DOS	Fortran 77	7.0
DEC	LSI-11/23	XENIX	C	9.3
IBM PC	8088	MS-DOS	C (D.R.)	12.4
OSBORNE	Z80A	CP/M	C (BDS)	15.2
DEC PDP-11/70		UNIX	C	1.5



AED

UNIVERSE SUPERCOMPUTER

have to spend time at your set. It takes operational skill and an understanding of the propagation effects of radio to really become a DXer. But they can considerably enhance the pleasure of short wave listening and extend the use of the rather expensive equipment.

Familiarisation

While listening around the short wave bands, you're bound to come across lots of radio telegraphy. This sounds like a conglomeration of blips, blops and chirping noises, most of which are unintelligible to the unaided ear. The microprocessor has leapt in here as well. With a suitable terminal unit which turns the audio signals into digital ones, it can decode these sounds and print the result on paper or display it on a VDU.

There are number of different codes in use today but probably the easiest to recognise is the one that Marconi used to transmit his first message: the letter 's'. This is a Dot-Dash code invented earlier by Samuel Finlay Morse, and named after him.

In Morse code each letter and number is represented by a series of dashes and dots, the letter A is .—; B —...; C—.—.; and so on, right down to ——.. which is the letter Z. Numbers are represented in a similar fashion, 0 being ——————; 1 .————; 2 ..———; down to ....— which is 9. On the radio you hear them as a pulse of single-pitched tone, the length of which dictates whether it is a dot or a dash, sounding rather like DAH DIT DIT DIT for B and DAH DIT DAH DIT for C.

Improvements

The 1940s saw the introduction of a new code in an attempt to improve the reliability and speed of data transmission. Called the Baudot code, it was used on machines made by the Teletype Corporation of America. This method of data transmission by radio became known as Radio Teletype of RTTY for short (pronounced 'Ritty'). The code is made up of five data units (bits) representing alphanumeric characters, with a start and stop bit added to tell the machine how to separate each one (Asynchronous). Each data bit can have a value of 1 or 0. In radio terms this is called a Mark and Space respectively, after the very early telegraph machines that made inky marks on long strips of thin paper tape. When transmitted over a wire, each bit can be represented by a current or no current; over the radio this is translated into two audio tones. More recently several new methods of RTTY have been introduced: these are TOR, ASCII and Packet Radio.

TOR stands for Telex Over Radio, of which there are two types, FEC and ARQ. FEC or Forward Error Correction transmits everything twice to try and overcome the constant problems of signal fading and interference on the short wave bands. The characters are interleaved, producing a fairly large gap between the first transmission of a character and the second, allowing time (hopefully!) for any spurious interference to die down. Using this method messages are transmitted to large numbers of receivers, but even FEC can be badly disrupted by interference. For this reason ARQ, standing for Auto request, came in.

ARQ is much more complicated and is intended for transmission of information between only two stations. It requires each end of the data link to have both a transmitter and a receiver. The information sender transmits data in blocks of three characters in such a way that the information receiver can test them for corruption by interference. If they are correct, then the information receiver sends an 'all clear' message

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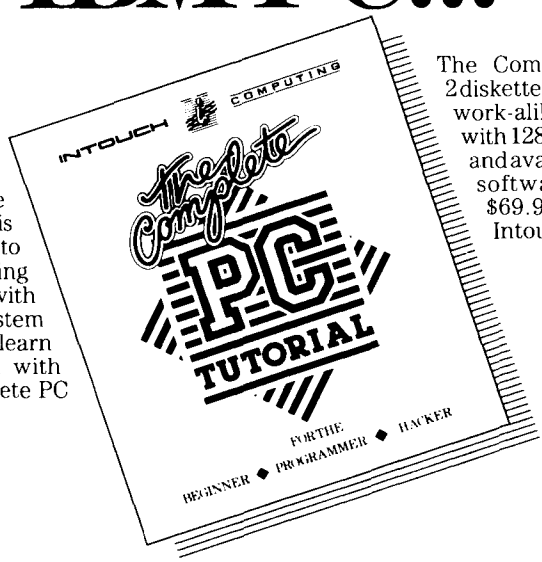

The Complete PC Tutorial comprises 2 diskettes and operates with an IBM-PC or work-alike running PC-DOS or MS-DOS with 128K RAM or better. It's unprotected and available from most software outlets at $69.95 or direct from Intouch Computing.

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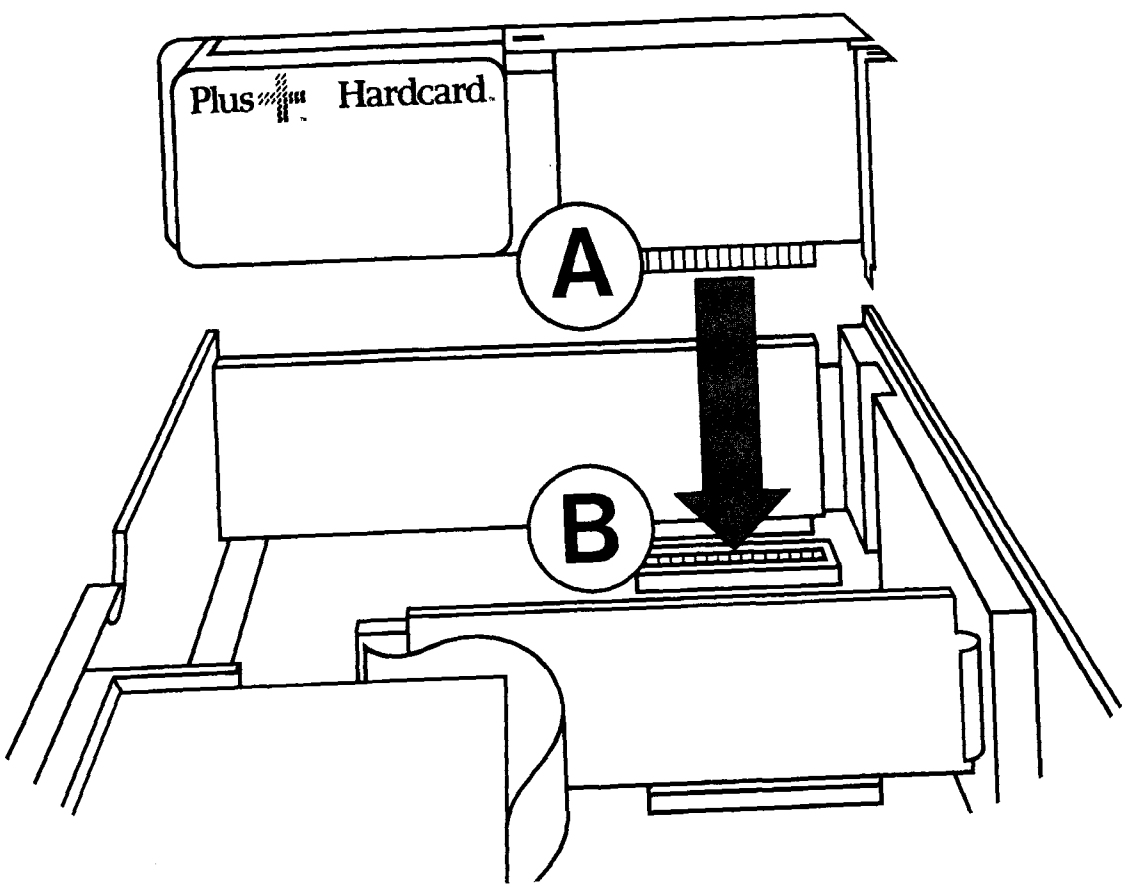
MAGNUM 5901B

Directions for converting a PC to an XT.

Insert tab A into slot B.



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back; if not, a request for a repeat of that block is sent. Using this method virtually error-free messages can be sent over long distances, even in the poorest of radio conditions.

Unlike the Baudot code which includes a start and stop bit in each character, TOR does not. Both ends of the communication link need to have their transmitters and receivers synchronised with each other. If they go out of synch, then the message becomes garbled.

ASCII transmissions and packet radio have come in with the increased use of microcomputers to decode RTTY. They use data formats similar to those with which computers users are already familiar. Using RTTY, messages can be sent at much higher data rates and with much greater reliability than other methods have allowed.

Objectives

The ~~technology~~ Marconi used was only capable of transmitting telegraphy by pulses, but while it is easy for us to transmit by voice telephony, you may well ask what is the point of all these codes. The answer is twofold. Firstly, voice transmissions use up lots more of the limited radio space; and secondly, RTTY is not as badly affected by interference — where a voice transmission might be completely obliterated by poor reception conditions, a RTTY signal can get through.

For these reasons some of those blips, blops and chirping sounds carry some interesting information. For example, most of the world's press agencies broadcast their news stories by some kind of RTTY on the short wave bands. It's fascinating to watch rows and rows of Teletype printers in a news room churning out news reports from all over the world, and also amazing how little of it actually gets into our newspapers or on to television.

Just as there are publications listing utility stations on the Short Wave, so there are publications listing RTTY stations. The rules of the Radio Communications Act (and the Secrecy Act) apply equally with RTTY. You are only allowed to receive information for personal, non-commercial use unless otherwise licensed to do so.

Radio teletype used to be, and still is in some places, decoded by mechanical teletype machines. These are large and limited in their application. Some people use them on an amateur basis but the microcomputer has made the reception of RTTY much more convenient.

There are two types of terminal units: dumb and intelligent. In both cases, the terminal unit takes the audio signals from the loudspeaker or recorder socket of a communications receiver and turns them into digital signals representing the marks and spaces of the telegraphic code. The dumb ones pass these on to a separate computer whose software decodes the telegraphy into text. The intelligent ones have a microprocessor built-in, decode the telegraphy and send it out on an RS232 or similar port, for printing or further computerised processing.

For dumb terminals prices range from $70 to $150, and a range of software for most popular home micros is available. Each of the telegraphic codes requires different circuitry to enable the audio signals to be decoded into digital form, so the cheaper ones usually only decode Baudot, RTTY and Morse. The more expensive ones will also decode TOR and ASCII. The Intelligent ones will usually decode Morse, Baudot, TOR (FEC and ARQ) and ASCII; some will even decode packet radio.

Skills

Whichever one you choose, you will have to develop some special listening skills. There are three possible variables associated with any RTTY signal: the two-tone frequency shift, the Baud rate, and the polarity of the mark and space tones — but more on this next month.

Information

For more information on all aspects of Short Wave Listening, it's worth joining The Wireless Institute of Australia (The WIA). It is to be found in all states of Australia and has special membership provisions for SWL's. If you can't find it in your local area, give the Federal Office in Melbourne a call on (03) 528 5962.

The nice thing about RTTY is being able to find an interesting station and then leaving the radio alone, and coming back later to read the telegraphy in peace; a scanning receiver and dedicated decoder makes it even nicer.

Whichever computerised communications system you choose:
DIT DIT DIT DIT, DIT DAH, DIT DAH DAH DIT, DIT DAH DAH DIT, DAH DIT DAH DAH, DIT DAH DIT DIT, DIT DIT, DIT DIT DIT, DAH, DIT, DAH DIT, DIT DIT, DAH DIT, DAH DAH DIT.

SUPPLIERS

SONY ICF-7600D Receiver.
Supplied by: Brashes, Myers and Maxwells.
If there is any difficulty finding any of these suppliers in your area Sony Australia Pty Ltd will be able to help. Their address is Talavera Road, North Ryde, N.S.W. 2113. Phone (02) 887 6666.

SANGEAN ATS803 Receiver.
Supplied by Dick Smith Electronics. They have branches in all states. If there is no branch near you try their head office at the corner of Lane Cove and Waterloo Roads, North Ryde, N.S.W. 2113. Phone (02) 888 3200.

Icon Receivers.
Icom Australia Pty Ltd distribute their receivers through Amateur Radio retailers. The Wireless Institute can help you find them or you can ask Icom themselves. They are at 7 Duke Street, Windsor, Victoria 3181. Phone (03) 529 7582 or (03) 51 2284.

Yaesu Receivers
Yaesu receivers are sold by Bail Electronic Services and their dealers and also by the Dick Smith organisation. Bail are at 38 Faithful Street, Wangaratta, Victoria 3677. Phone (057) 21 6260.

Kenwood Receivers
Trio-Kenwood Australia Pty Ltd distribute their receivers through Amateur Radio retailers. The Wireless Institute can help you find them or you can ask Trio-Kenwood themselves. They are at 4E Woodcock Place, Lane Cove, N.S.W. 2066. Phone (02) 428 1455.

J.R.C. Receivers
In New South Wales these receivers can be bought from Emtronics Pty Ltd. Emtronics are at 92-94 Wentworth Avenue, Sydney, N.S.W. 2000. Phone (02) 211 0988.
In Victoria these receivers can be bought from Vicom Australia Pty Ltd. They are at 57 City Road, South Melbourne, Victoria 3205. Phone (03) 62 6931.
Both these companies have dealers in other states and will be happy to help you.

Active Antennas
These are not an uncommon item. Some receiver manufacturers make active antennas especially for their receivers, Kenwood is an example. Other active antennas will fit almost any radio. Emtronics have a particularly good one.

Radio Teletype Decoders
Eastern Communications Pty Ltd have the Hampack 3 decoder for Apple computers. This includes all necessary hardware and software. They will soon have an equivalent for the IBM PC. They are at 168 Elgar Road, Wattle Park, Victoria 3128. Phone (03) 288 3107 and (03) 288 3611.
Emtronics also have a couple of very good American decoders. Emtronics are at 92-94 Wentworth Avenue, Sydney, N.S.W. 2000. Phone (02) 211 0988.
There is a kit from the Dick Smith organisation, amongst others. Look around before buying one of these. There are many variations on the theme and one is likely to suit you better than the others. END

The Great Galactic Conflict — the largest computer game in the world!

Microtex has given APC a sneak preview of what will be the largest-ever computer based multi-player game. Up to 1,000 'warriors' will battle it out in a period of inter-stellar unrest — when treachery and deceit are ever-present. Code-named Great Galactic Conflict, it is to be enacted on Telecom's national Viatel service: it's a game of strategy and negotiating skill — Ian Davies takes a look.

The Great Galactic Conflict is a multi-player game of strategy soon to be released on Viatel by Microtex 666. It is also, to our knowledge, the largest computer game in the world. *APC* has taken a sneak preview of the game during an internal test conflict.

The objective of the game is roughly similar to 'Diplomacy', the well known board game, in that each player must attempt to gain as much territory as possible through the use of negotiation with other players. That is as far as the similarity goes, however, as The Great Galactic Conflict is a whole new kettle of fish — about as similar to Diplomacy as Blackjack is to Poker. However, like card games, anyone who has played Diplomacy and been bitten by it will also be bitten by The Great Galactic Conflict — only more so.

To add spice to the bite, Microtex is offering $5,000 in prize money, with many consolation prizes in addition to the whopping 'ruler of the universe' first prize.

The game

The Great Galactic Conflict is based in outer space, where a number of independent civilisations have all attained inter-stellar flight capability at about the same time, and a great expansion has begun. Each player represents one of these civilisations, and is known by a chosen psuedonym.

The universe consists of 20 constellations, each of which contains about 380 solar systems, approximately half of which are 'star clusters', the remainder being the more valuable 'planetary systems'. Each sector may have, at most, a maximum of one battle fleet residing in it. Players are initially allocated three battle fleets each.

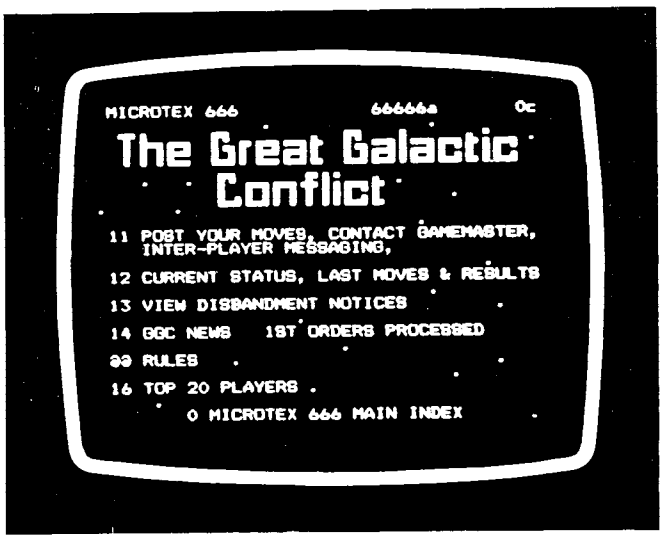
'As you can see, there are no rules of common decency in The Great Galactic Conflict, except those inspired by self-interest.'

Players send orders to their fleets to tell them what they should do on the next move. The game is played with two moves a week, so there is plenty of time for players to formulate their strategies and post their moves. All moves are made simultaneously with the success or failure of a move depending upon the strength which can be rallied in support of the move.

Support can come in two forms: either support in the defence of a fleet, or the support of an attack against a fleet (known as reinforcement in GGC parlance). Support can, however, be cut by an attack being made upon the fleet which is offering the support. This causes the supporting fleet to start worrying about its own existence thereby distracting it from its supporting move.

Where two forces attempt to attack into the same sector with equal force, the result is a stand-off, and neither moves. Of course, following the stand-off, each force knows what the other is up to, and must negotiate greater support for the move, or arrange some deal between themselves.

When an attack force succeeds, the fleet which has been beaten makes an automatic retreat to an adjacent and unoccupied sector. If no unoccupied


MICROTEX 666
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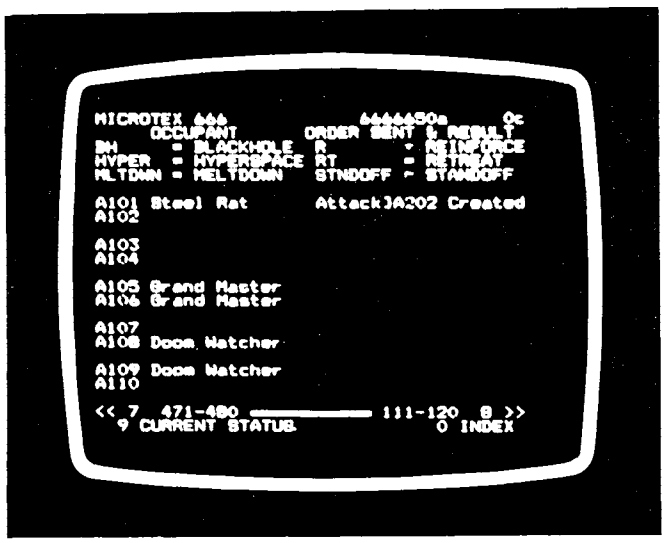
The Great Galactic Conflict
11 POST YOUR MOVES, CONTACT GAMEMASTER, INTER-PLAYER MESSAGING,
12 CURRENT STATUS, LAST MOVES & RESULTS
13 VIEW DISBANDMENT NOTICES
14 GGC NEWS 1ST ORDERS PROCESSED
99 RULES
16 TOP 20 PLAYERS
0 MICROTEX 666 MAIN INDEX

The Great Galactic Conflict main menu



A Microtex page showing the Steel Rat's successful attack on A202

sectors are available, the fleet is totally destroyed.

Although each player has three initial fleets which may support and reinforce each other, real power is attained by organising alliances with other players. These tense negotiating sessions take place over inter-galactic communications facilities, (that is, Viatel messaging). All communications between players take place covertly. However, players often choose to keep other allies informed of their negotiations. Players choose their own pseudonyms when they join the GGC, thus ensuring that nobody really knows who they are dealing with. This can be essential from the personal safety point of view, as we shall see.

In a typical negotiation scenario, one player (Zaphod Beeblebrox), would notice that another player (Arthur Dent), holds a number of strategic sectors which may interfere with a planned move, or whose support is crucial for a move to succeed. Mr Beeblebrox would then send a message to Mr Dent offering some sort of arrangement or pact, for example, "if you support me in my attack against Luke Streetwalker, I'll not only support you against Vinnie Vogon, but also won't destroy your ship orbiting Vega". Arthur would then respond, and after suitable negotiations, a deal would be struck. What happens then is entirely up to the scruples and business sense of each player. For example, Zaphod might assume that Arthur will keep his word, and will obliterate his Vegan ship anyway, or might renege on his promise of later support. Alternatively, Arthur Dent might secretly raise a force against Zaphod Beeblebrox, knowing what Zaphods plans are on the next move, and hoping that none of the other players he is dealing with are passing his intentions back to Zaphod. Yet another possibility is that both will keep their word and act as agreed.

As you can see, there are no rules of common decency in The Great Galactic Conflict, except those inspired by self-interest. Double crossing a player can result in getting a bad name in the neighbourhood, thereby making it difficult to obtain other pacts. Of course, bad names can also be generated maliciously.

Very little is left to chance in The Great Galactic Conflict, the outcome is determined by only two factors: the player's ability to strategise and the player's ability to negotiate.

Orders

Players send orders to their battle fleets through the use of a Viatel response frame. The most basic order is the attack, which causes a fleet to attempt to move from one location into another. Fleets may only attack adjacent locations.

Each fleet may only receive one order at a given time. If multiple orders are issued for the one fleet, the latest order is the one acted upon. If an order is invalid for any reason, the effect is as though no order was received for that fleet, meaning that the fleet will defend itself, but take no other action. Players may only send orders to their own fleets, reasonably enough.

The Viatel response frame has space for three orders to be sent at one time, and is arranged in columns for the various components of each order. The most basic orders are ATTACK, UPHOLD the defence of a fleet, and REINFORCE an attack against a fleet.

Other orders include a HYPERSPACE facility for fast, long distance travel but with an element of risk, and a DISBAND command, sometimes required after you have over-reached yourself.

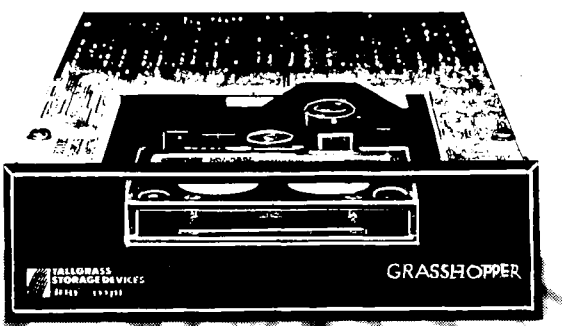
Winning

The key to winning The Great Galactic Conflict is to capture the most planetary systems. This is done on the basis of occupancy, or most recent occupancy. Ownership of a planetary system entitles that player to an additional fleet, which is automatically created in one of his unoccupied systems. Obviously the more fleets a player has, the greater his power and reach.

Although new fleets are created in planetary systems, players need to move out of their planetary systems in order to go attacking. It is very important to leave the vacant system well defended, as it is ownership of that sector which allows the fleet to exist. In other words, the total number of fleets any player possesses must always be equal to the number of planetary systems he owns.

Should an alien force invade a player's planetary system, one of that player's fleets must be removed, as it has become inadequately supported by groundside logistics. A display posted to Viatel shows when this has occurred, indicating both the psuedonym of the player or players concerned, and the number of ships which must be disbanded. Those players must then post in disbandment orders for the appropriate number of ships, otherwise the necessary number of ships will be automatically disbanded by the system. Since ships for automatic disbandment are selected randomly, players need to constantly watch the disbandment lists so that, should the event occur, they can

A JUMP AHEAD



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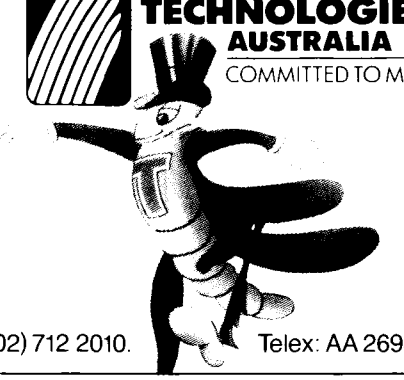

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2277/APC/Little

hand pick their own least strategic ships.

The loss of planetary systems and the consequential disbandments can be a great interference to long planned strategy. Many a *coup de grace* has failed due to excited conquerors failing to protect their assets properly.

It is through the rules of creation and disbandment of ships that players can become more powerful and capture more solar systems, thereby winning the cash.

Black holes

To add interest, each constellation has an unknown number of black holes residing at unknown positions. Black holes cannot be seen on the star map provided with the game, so any wandering ship runs the risk of blundering into one.

The effect of walking face first into a black hole is that the ship is projected through a 'worm hole' in space to reappear at some other location. Due to the nature of black holes, they do not always lead to the same destination, and very rarely lead to another black hole which will provide passage back to the starting position. Often, a black hole will deposit a ship in entirely another sector of the universe.

These traps create an interesting variation to the game, as a player in the process of executing a carefully planned stragegy will want to avoid black holes, but can only know that a black hole exists by watching some other ship wander into it, and disappear. On the other hand, a player who is about to be obliterated may choose to use a black hole as a means of escape.

As there are only about three black holes in any one constellation, the chances of encountering one are rather slim, however, players who are in it to win will remain carefully vigilant for ships being swallowed by black holes, thereby ascertaining their position for strategic purposes, or obtaining saleable information. A display on Viatel shows where unlucky spacefarers have been deposited by the black hole.

The managers of The Great Galactic Conflict annoyingly agreed that it was most unlikely that a black hole could ever move, but did not go so far as to say that it never happens.

The expanding universe

The Great Galactic Conflict has capacity for up to 1000 players at any one time. Because all 1000 probably won't start at the same time, the managers of the game will open up new constellations as players become available to populate them. This makes it fair to latecomers who otherwise would join the game only to find the cosmos overrun.

Included as part of the Viatel component of the game is a news service which advises players of when new constellations are brought online. Once a constellation full of new players has been opened, trade lanes are created between it and the older constellations, thereby allowing travel between the two. Generally, players who are doing so well that they need room to expand will leap at the opportunity to colonise a virgin constellation, however, less successful players who are looking for somewhere to run may also be just as eager to be pioneers.

As there are relatively few interconnections between constellations, these 'highways' are popular thoroughfares and the rules of standoffs become particularly relevant. This means that in the great rush to attack a new constellation, those players who can obtain co-operation in advance are best positioned to get through quickly.

The problem to the newcomers of course, is that as soon as their constellation is brought online, there will most likely be an influx of experienced warriors looking forward to beating them senseless and capturing all their strategic positions. On the other hand, the new boys on the block might always choose to join forces and leave guards near the entrances to their constellation ready to overwhelm the would-be invaders.

'Very little is left to chance in The Great Galactic Conflict, the outcome is determined by only two factors: the player's ability to strategise and the player's ability to negotiate.'

The Viatel connection

The Great Galactic Conflict posts several hundred pages of information up to Viatel after each move. It is not necessary for each player to read all of the data posted, as generally they will only be interested in their own neighbourhood, in which case only a couple of pages need to be viewed.

Three main displays are provided on Viatel for viewing the results. The current status display is the main one, which shows, by sector, who is the current resident, or who last held it, in the case of a currently unoccupied planetary system. This display is essential when planning strategy, as it shows where everyone is.

The moves and results display is important when analysing the outcome of a move. It shows, by location, who was the occupant on the last round, the order that was sent in, and also the result of the order. This display can be used to see when players have not kept their bargains or if the bargain was kept but the attempted action was thwarted. Microtex has thoroughly indexed both of these displays to facilitate easy and fast access to any part of the galaxy, as well as cross references.

The disbandment display has already been mentioned, and shows those players who have overreached themselves and lost ownership of one or more of their planetary systems. This display is extremely important, as players always need to be aware if one of their planetary systems has been captured, otherwise the corresponding number of ships will be forceably disbanded.

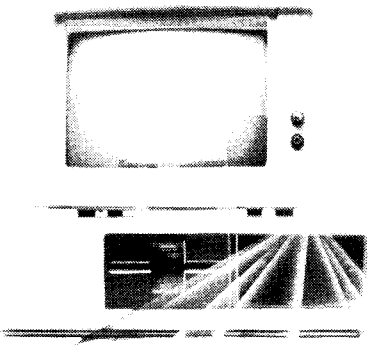
A fourth display is also posted, but this will only be of interest to an elite few. The fourth display is the Top 20 list. It shows the top twenty players and their scores, that is, the number of occupied planetary systems. Player names are also displayed on this page, with the number one player specially highlighted. Initially, the Top 20 list will be empty, as all players will possess only their regulation three solar systems. However, as the conflict develops, clear leaders will be evident. During the closing stages of the game, the Top 20 list will be crucial, as the best two or three players vie to be number one. It may even happen that a less successful (but still powerful), player may agree to assist a number two or three player for a cut of the prize money!

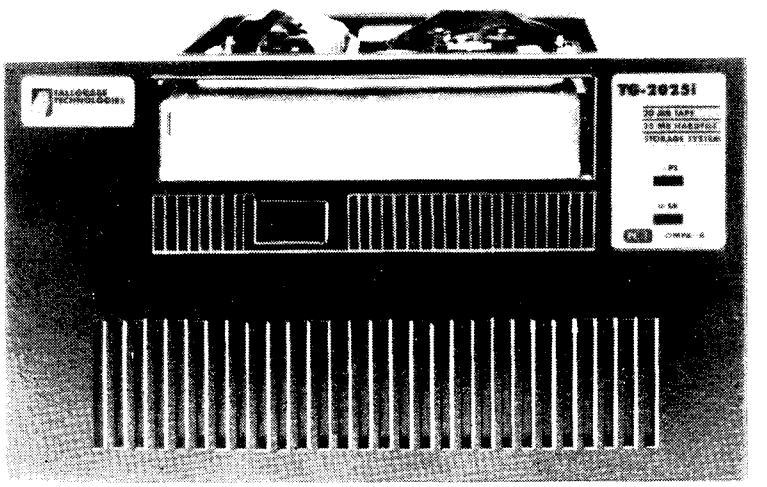
How it works

The technology behind The Great Galactic Conflict is impressive to say the least. More than twelve months of planning, design and implementation have gone into the finished product.

The game is linked to Viatel through the 'bulk update protocol', a fiendish means of interfacing computers with the Telecom service. A response frame in the Viatel database is used to accumulate the players' intended moves until one of the Microtex computers clears the mail using the message retrieval facility of the bulk update protocol.

THE SINGLE SOLUTION





THE GRASSHOPPER TAPE/DISC COMBINATION UNIT.

Traditionally, the PC owner's first concern was data storage capacity. The recognition of the need for back-up came later, sometimes much later, sometimes too late. So that PC users would have an immediate and simple means of backing-up their hard disk, Tallgrass introduced the Grasshopper internal tape back-up system. Now, Tallgrass have combined 20 Megabyte cartridge tape back-up with 25 Megabyte of hard disk storage.
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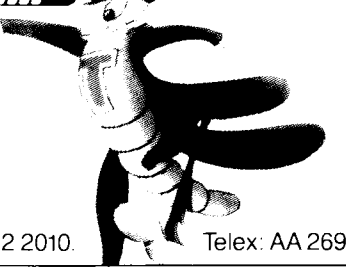

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The Microtex computer then parses out the relevant portions of the messages and stores the result in a disk file.

From here, a complex set of twelve programs is run sequentially to execute the various aspects of the game. Each program utilises the central GGC database and passes temporary files to other programs. The database itself is a large relational model consisting of topographic information, player information, intermediate result data and current game status. A separate set of relations map the internal representation of players and locations into the corresponding external representation.

'The effect of walking face first into a black hole is that the ship is projected through a 'worm hole' in space to reappear at some other location.'

Each of the programs which implement the game has a restart capability, so that in the event of a system hardware or power failure, processing can be recovered from the point of failure without loss of data.

The final phase of processing is another bulk update program which uploads the results of the previous round into the Viatel database. This program generates most of the colour and graphics which can be seen in the database, as well as automatically linking the pages together for routing purposes. For a full 1000 player game, more than 800 frames are refreshed following each move.

Most of the processing required for The Great Galactic Conflict is rather lengthy and, as such, Microtex tends to run it at night. The Microtex computer is able to automatically establish the Viatel link soon after midnight on the 'move' nights.

One of the most impressive pieces of technological magic is that which lets players communicate anonymously. This is a dedicated computer permanently connected to Viatel which acts as a 'clearing house' for all message traffic. Inter-player messages are received by the machine, which parses out the text of the message as well as the psuedonym of the player it is being sent to. The machine then reformats the message, removes all identifying marks and posts it through to its final destination. In this way, players can communicate even though they don't know each other's Viatel numbers.

In addition to the computerised aspect of The Great Galactic Conflict, Microtex also carries out a number of 'game management' tasks, such as the registration of new players, the news service, opening new constellations, designing the universe and generally keeping an watchful eye over the cosmos to make sure all is running well. Microtex does not plan to become involved in individual disputes between players, however. Its function is to keep the whole thing running, rather than the administration of vengeance.

Joining

The Great Galactic Conflict is in a Viatel 'closed users group', which means that only registered users may take part in the game. The cost of joining the game is planned to be a one-time charge of $20.00 (less for Microtex members), which will not only gain entry to the fracas, but also a map and rule book, including notification of where the initial three ships are located.

A charge is also made for each move, and should be five cents per three moves, which covers Microtex's cost of online bulk update time. This would seem to be quite reasonably priced, as for 10¢ per week members get to take part in the biggest thing since World War III. Microtex comments that these costs may vary before the game is finally launched, in order to match running expenses.

The game is due to be launched in August, and is expected to be accompanied by a media splurge.

Conclusion

From what we have seen of The Great Galactic Conflict test games, it certainly promises to be an exciting event of nationwide proportions. It's not every day that the world's largest computer game starts in Australia.

I suspect that The Great Galactic Conflict will attract all those people who are Diplomacy fanatics, or who think they are good business people, or who think they're pretty good at chess, or who just think they can deal well with people. Additionally, all the 'war game' devotees should flock to join.

I for one certainly plan to be one of the starters in the first constellation opened. Watch out! END

Editor's note: Microtex advises us that 'The Great Galactic Conflict' is only a code name; a trade name will be announced in June.

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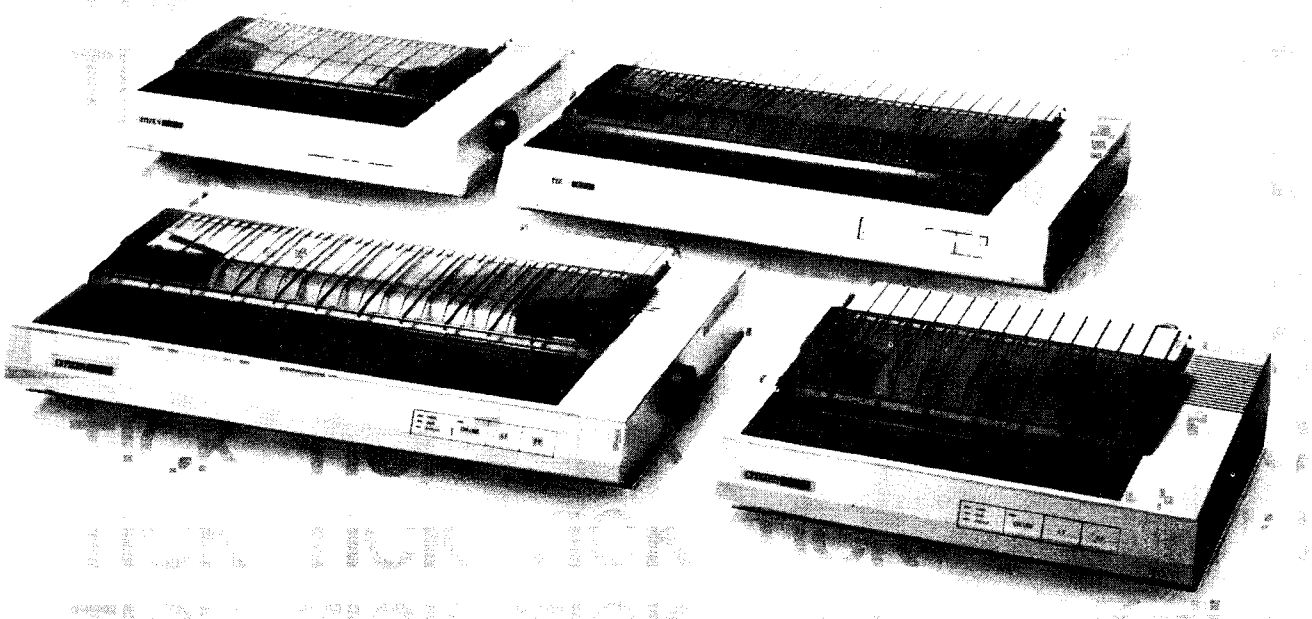

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dBaseIII Plus

The microcomputer database market has recently been deluged with new software packages. A recent arrival is an updated version of the successful dBaseIII. We sent Ron Dunn a copy of dBaseIII Plus, and asked for his comments.

When asked to review the new release of dBaseIII, I had quite mixed emotions about the request. While I always welcome the chance to review new software, my experiences with this range in the past had not been terrific.

dBaseIII Plus is produced by Ashton Tate, and follows the family line from Vulcan, to dBaseII (with many incarnations), and dBaseIII. It offers file manipulation capabilities at the interactive level, and provides a level of programmability. This feature has been so successful in the past that the dBase family has achieved defacto status as a programming language.

As a programmer I hated dBaseII. It was slow and clumsy, and systems implemented under it left much to be desired.

dBaseIII was not much better. It was a little faster, had some more language commands, and a slightly better implementation of structured programming concepts. But dBaseIII was clumsy to use in an interactive mode, and the documentation was dreadful.

It was with interest, therefore, that I sat down to review dBaseIII Plus. Admitting to preconceived ideas about the package is not hard in this case — I expected it to flop.

Finally, the basis for a review of a database management system can vary. A programmer has different requirements from a casual hobbyist, for example. This review considers each package in the corporate environment — where most sales of the packages are to be expected.

Network support

The new release of this package is touted as offering several significant enhancements: network support, user support, and programming extensions.

Network management is provided for both the IBM PC Network and the Novell Advanced Netware/86 software. Networking requires either one copy of dBase per station, or a special LAN pack. The LAN pack is documented as providing support for four users, in addition to one copy of dBaseIII Plus.

Our dBase system consisted of two copies of dBaseIII Plus, installed on an IBM PC Network consisting of one PC/AT, and two PC/XTs. At all times the package functioned without difficulty.

'As a programmer I hated dBaseII. It was slow and clumsy, and systems implemented under it left much to be desired.'

Installation of the network environment consists of loading three program files. These are called Administrator, Access and Protect.

The Administrator program controls the standard dBase operations, with file and record locking implemented. Access is a program that must be run by each user to provide workstation management facilities. Protect provides database security over the network, with the facility password access and data encryption.

'The ability to share data between a number of concurrent users does, however, more than make up for a minimal loss of machine performance.'

The operation of a network is carefully and thoroughly documented. Commands exist for the sharing and locking of both files and records, and considerable documentation is devoted to programming with the network.

The manual is very responsible in pointing out the need to test application impact on the network before implementing data processing systems. We implemented several small systems and noticed *slight* degradation over stand-alone dBaseIII Plus, but each application must be taken on its own merits. The ability to share data between a number of concurrent users does, however, more than make up for a minimal loss of machine performance.

General enhancements

The extensions to the programming language are shown in Fig 1. Several new concepts and facilities have also been introduced. These are:

Cataloguing: a facility to group related files in a logical set, with the ability to limit user access to selected catalogues.

View Formats: the View facility allows the transparent linking of two or more tables, similar to the Relational Join operator.

Queries: interactive support is provided for the definition of filter commands, which may be saved on disk and executed at a later date.

Screens: a new screen painter has been provided, with the ability to define multiple page forms. Box and line drawing functions are now part of the language.

Debugging: an interactive debugger is now provided within the package, supported by the History, and Suspend/Resume functions. These allow the storage of past commands executed, and the trapping and handling of errors at run time.

Programmers will be pleased to note the inclusion of an in-line comment facility. dBaseII hackers will no doubt be impressed with the re-inclusion of

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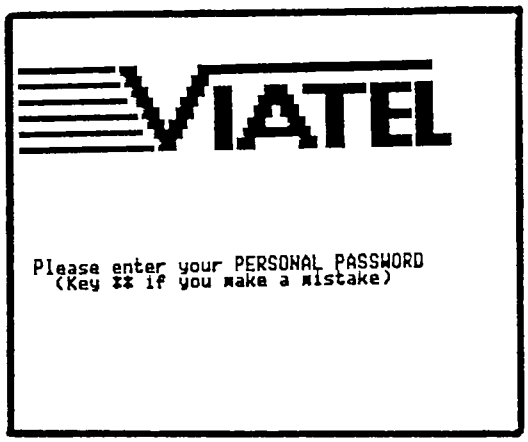

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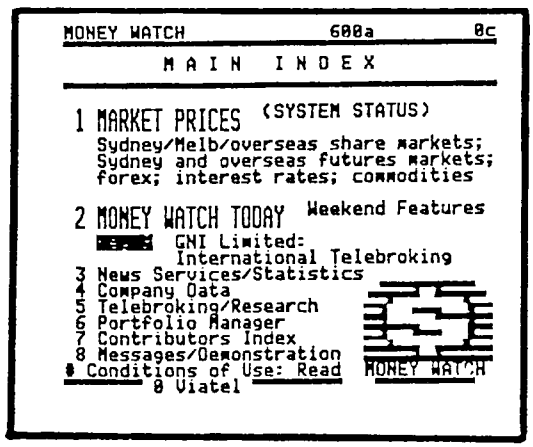

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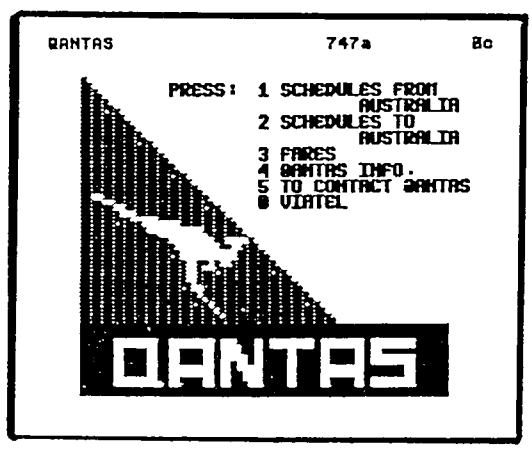

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assembly language module support.

Also of interest is the fact that existing dBaseIII programs require no conversion, with one exception. The SET COLOR command no longer supports character identifiers for screen colours. Numeric identifiers only must be used. Arithmetic accuracy has also been improved, and may require some logic changes in dependent code.

Assist features

The most visible change to the package is the new Assist function, automatically executed when the package is first started. This is an interactive, menu driven facility, similar to that implemented in Ashton-Tate's Framework. Most simple database concepts can be implemented from these menus, including View and Query operations.

The creation of moderately different queries and table views is quite easy, with all steps clearly prompted. The on-line help facility is available, but is not always appropriate to the user problem.

The Assist menus are clearly structured, and quite easy to use. You will, however, need to refer to the manuals for the first few times you use some of the more advanced features of Assist.

&&	Append comment to program line
CALL	Execute loaded binary file
CLEAR TYPEAHEAD	Empty typeahead buffer
CREATE/MODIFY QUERY	Query file maintenance
CREATE/MODIFY SCREEN	Screen painter execution
CREATE/MODIFY VIEW	View file maintenance
DISPLAY HISTORY	Show commands in history file
EXPORT	Convert file to PFS format
IMPORT	Retrieve PFS file
LIST HISTORY	Print history file commands
LOAD	Place binary file in memory
ON ERROR/ESCAPE/KEY	Execution transfer (like BASIC)
READ	Accept multiple page screen form
RELEASE MODULE	Drop binary module from memory
RESUME	Cancel SUSPEND command
RETRY	Return to calling line
SET CATALOG	Determine if catalog should be updated
SET CENTURY	Date format - YY or YYYY
SET COLOR	Colour / Monochrome display toggle
SET DATE	Determines date format
SET DOHISTORY	Determine history logging ON/OFF
SET FIELDS	Update field pool
SET FILTER TO FILE	Activate query file
SET HISTORY TO	Specify line buffer size for history
SET MEMOWIDTH TO	Adjust memo column width
SET MESSAGE TO	Message for APPEND and EDIT
SET ORDER TO	Open index as controlling file
SET STATUS	Toggle status line ON/OFF
SET TITLE	Turn catalog title ON/OFF
SET TYPEAHEAD	Set buffer size
SET VIEW TO	Open view file
SUSPEND	Halt program execution
ABS()	Return number absolute value
DBF()	Name current file in USE()
DISKSPACE()	Return bytes free on disk
ERROR()	Return error number
FIELD()	Name fields in file
FKLABEL()	Return function key name
FKMAX()	Determine maximum function keys
FOUND()	File search result
GETENV()	Operating system environment variables
IIF()	Immediate IF
INKEY()	Last key pressed
ISALPHA()	Input evaluation
ISCOLOR()	Colour mode evaluation
ISLOWER()	Input evaluation
ISUPPER()	Input evaluation
LEFT()	Substring from left
LTRIM()	Remove leading blanks
LUPDATE()	Return last update date
MAX()	Greater of two values
MESSAGE()	Return message string
MIN()	Lesser of two values
MOD()	Modulus from division operation
NDX()	Names open index files
OS()	Names operating system
READKEY()	Key used to exit full screen
RECCOUNT()	Number of records in file
RECSIZE()	Record size in file
REPLICATE()	Repeat character function
RIGHT()	Substring from right
RTRIM()	Remove trailing blanks
STUFF()	Replace portion of string
TRANSFORM()	Output field under picture
VERSION()	dBASE III Plus Version

Fig. 1 — Programming Language Extensions

Documentation

It seems that the dBase documentation grows larger with each release. dBaseIII originally received quite a degree of criticism for the errors contained in its manuals. I am pleased to report I could find none in the new release.

The dBase documentation is now in two separate binders, again similar to Framework. Again, however, they are overfilled. I was continuously damaging pages in moving from one section to another. This was my only criticism of otherwise excellent documentation.

'dBaseIII originally received quite a degree of criticism for the errors contained in its manuals. I am pleased to report I could find none in the new release.'

Volume One of the manual is devoted to an Assist tutorial, and Command and Function reference. Error messages, utilities and basic appendices are also contained in this manual. This can really be considered the User Manual.

Volume Two is the Programmers' Manual. It contains the system diskettes, and detailed instruction on the development of dBase programs. Network support is also documented in this manual, with an extremely thorough treatment of the subject.

Applications generator

Also included in the package is an applications generator. This functions at a fairly elementary level, and is designed for the creation and support of simple, menu driven applications. The Generator is itself a dBase program suite. It is easy

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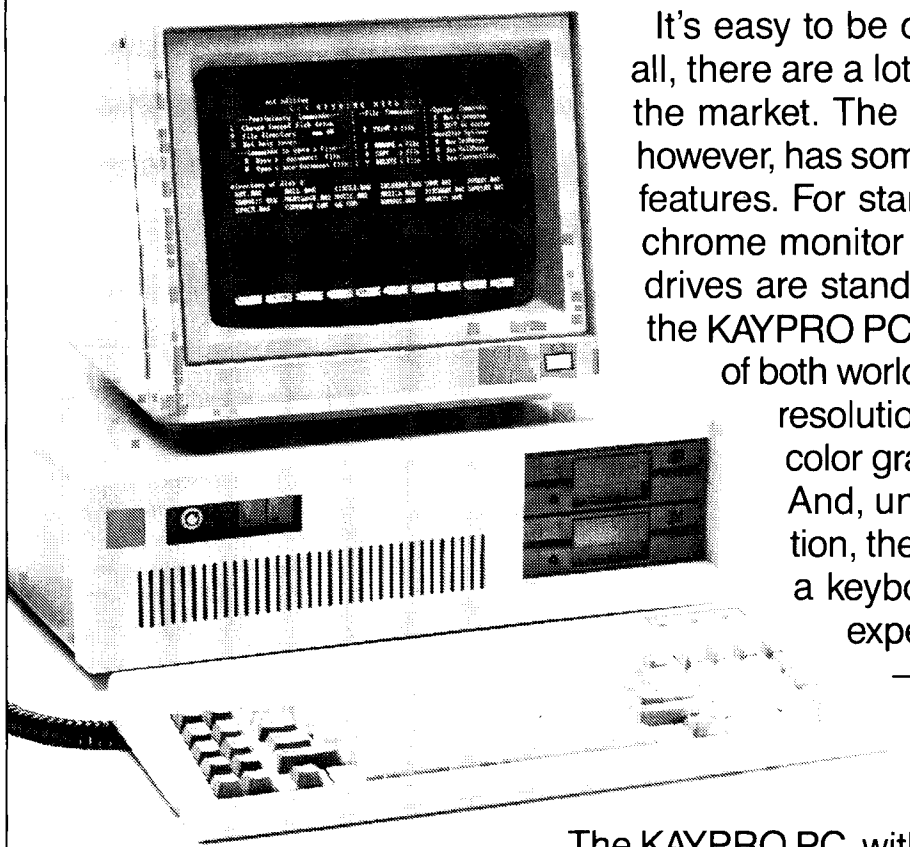

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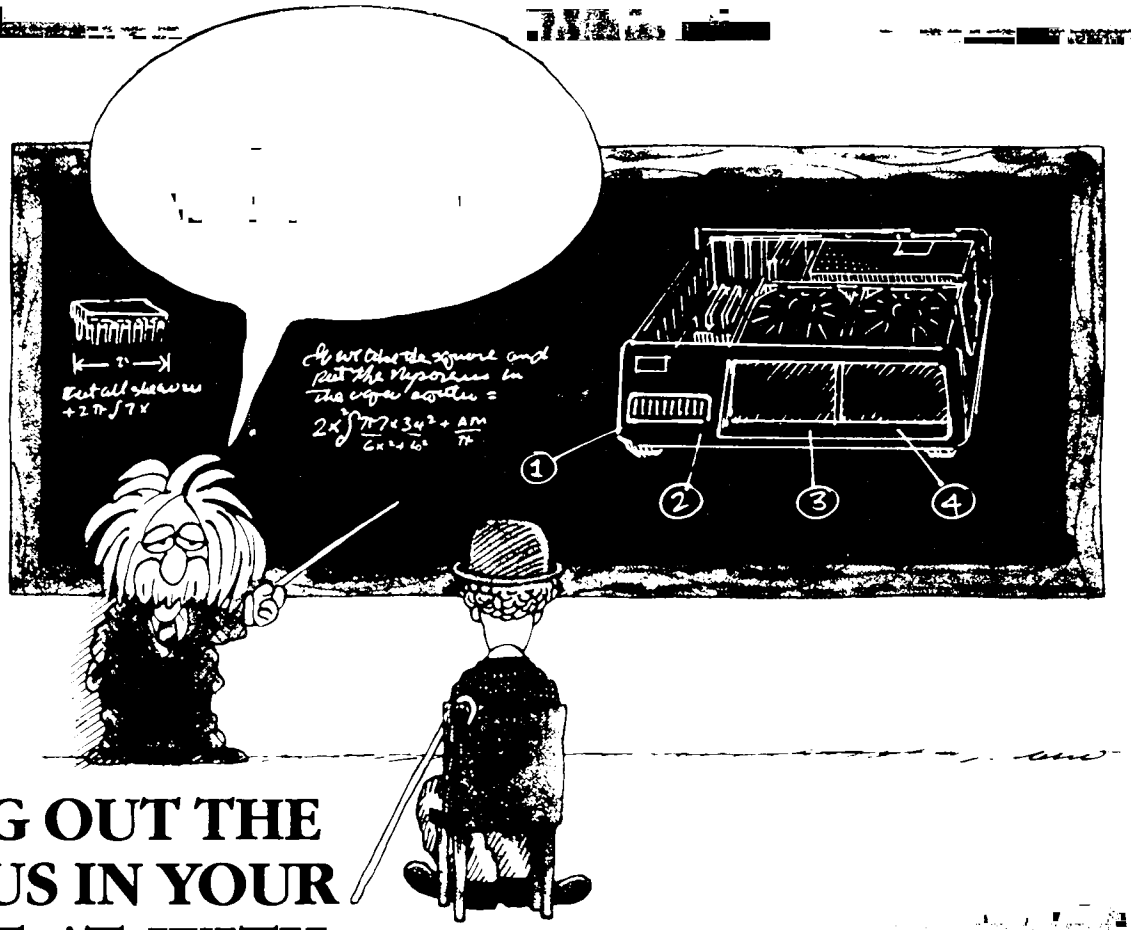

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to use, and ideal for the support of novice users.

The applications generator is documented in a small, separate booklet, making it ideal for the novice user. It covers the creation of a somewhat trivial accounts receivable application, but in a manner that will be easily adapted to user systems.

On the whole, the applications generator would be very useful to the novice user, concerned mainly with the development and support of single-table list processing applications.

Summary

dBaseIII Plus compares very favourably with its competitors. I consider it superior to Paradox and RBase, and a long way ahead of the PFS-style applications marketed by many other companies.

The program still lacks a few features needed to make me use it on a day to day basis. For example, the provision of a system developers' kit with the ability to produce stand-alone, compiled code would be invaluable. At present only a pseudo-compile, still requiring a dBaseIII system, is available. But as a product for a group of users requiring data storage and manipulation facilities it is a realistic choice.

As the computing world moves closer to the truly relational model of data management, products like dBaseIII Plus lead the novice user in the right direction. Don't be fooled, though, dBase is nowhere near 25 per cent of a full relational implementation. It is, however, a good general purpose compromise between programming languages, and the SQL style facilities provided by SQL/PC and others.

I was wrong about dBaseIII Plus. At $1095 dBaseIII Plus is an excellent example of its class of product, and should be given serious consideration by all potential database users.

END

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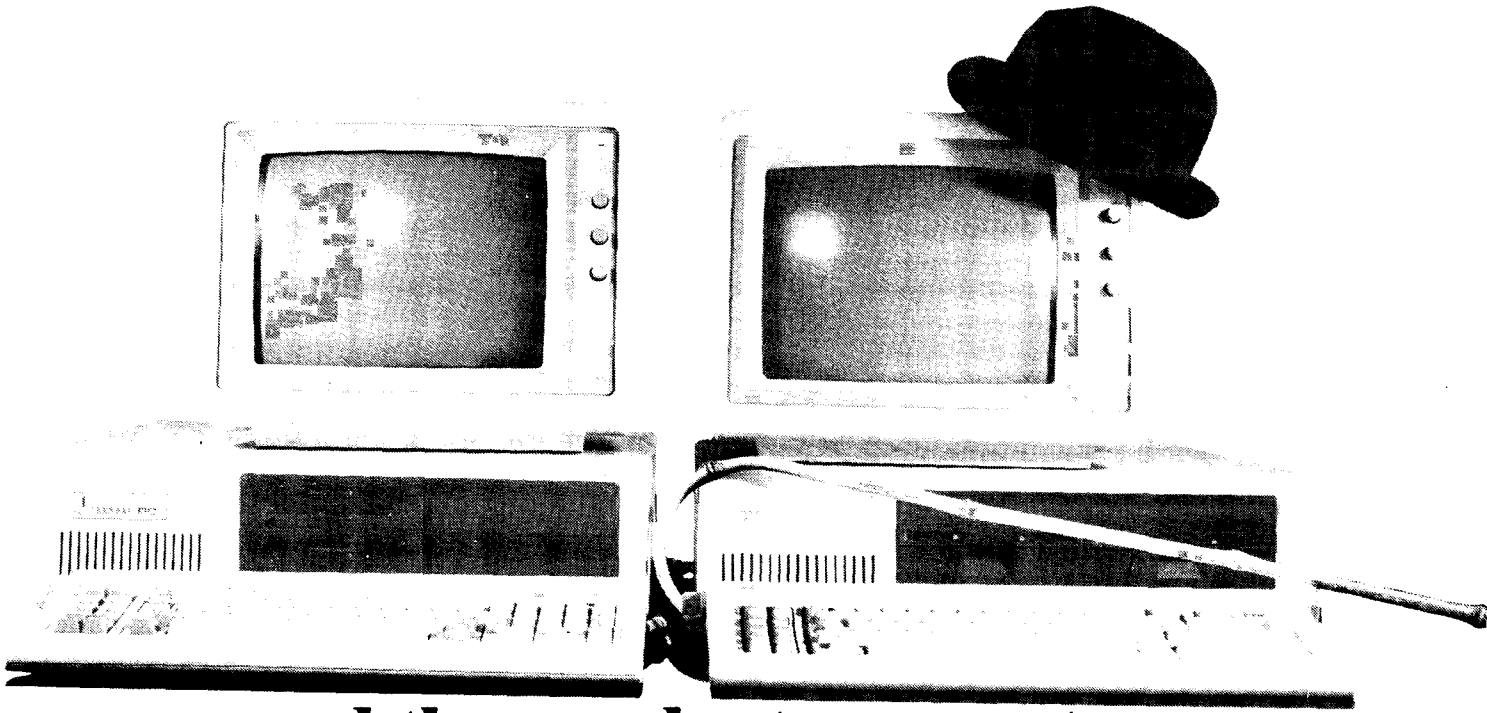

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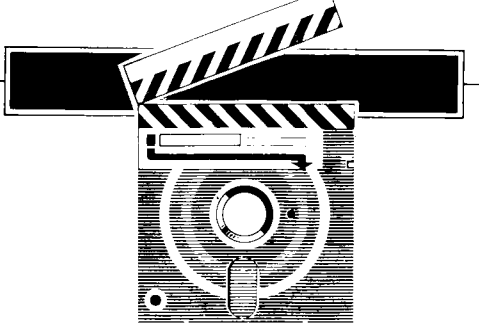


SCREENTEST

Microsoft Logo

Microsoft Logo is a comprehensive version of the Logo language for the Apple Macintosh, but it does have its faults. Owen Linderholm tests it out.

The only language for the Macintosh which Microsoft has produced prior to Logo is Microsoft Basic. When it first appeared, as version one, criticism was levelled at it because it did not make sufficient use of the Mac's features. This was remedied in version two, which allowed full control of windows, pull-down menus, and so on.

Microsoft Logo, unlike Microsoft Basic, has not been written by Microsoft but by Logo Computer Systems Inc. It also has the sanction of the father of the Logo language, Seymour Papert. My expectation was that a version of Logo which had been approved by the highest authority, and which was to work on the Macintosh, would be a very exciting product. In some respects Microsoft Logo easily lived up to my expectations, but in others I found it hard not to feel disappointed.

In use

The Microsoft Logo package comprises a single disk and three manuals: a *Reference Manual*, a *Guide to Programming* and a *Quick Reference Guide*. The disk includes various files apart from the language itself: there are several Logo demonstrations; and various files concerned with configuring Logo to suit your preferences and the amount of memory available. I was pleased to see this, as other versions of Logo I have looked at only recognise a maximum of 64k memory.

Not surprisingly, Microsoft Logo is heavily influenced by the Macintosh, with separate windows for different purposes. Initially the display shows two windows — one labelled Text, the other Graphics. The menu bar at the top of the screen shows three options — File, Edit and Debug.

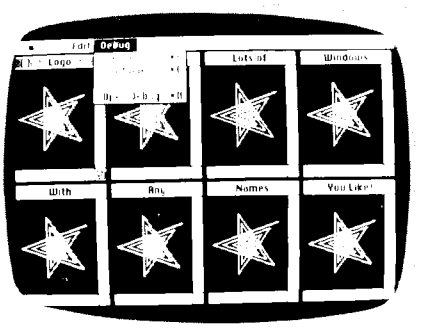
Communication with the language is via the text window, where there is a flashing cursor which can be moved using the mouse and pointer. Any text typed is inserted on the text window at the cursor.

The demonstration programs written in Logo which accompany the language show that this version of Logo is certainly capable of some very powerful things. Almost all the Macintosh features can be controlled; the only exception is pull-down menus, and no indication as to how to use these is available at the time of writing.

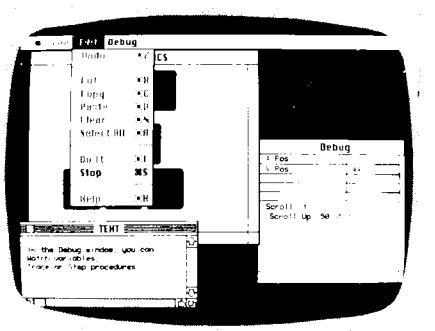
Logo is a structured language but is slightly unusual in that it is modular, and is related to Lisp in the way that it uses lists and properties. Microsoft Logo has all the commands of a standard Logo for list processing, program control, workspace management, turtle graphics, variable assigning and mathematics, and these all work as expected. However, there is one difference in the format of standard commands between Microsoft Logo and other versions of Logo I have used, and this is the IF command. On previous encounters, the command consisted of IF followed by a predicate such as :A = :B followed by one or two lists of commands. If the predicate was true, the first list was executed; if not, the second list was executed, if it existed, otherwise the next command was executed. Microsoft Logo separates these two possibilities into two commands, IF and IFELSE, with one or two lists to be executed respectively. Fortunately, this does not make it too difficult to convert programs to Microsoft Logo from other versions.

The standard Logo convention of having a separate editor for inputting procedures is adopted by Microsoft Logo. This can be activated from a pull-down menu or from the standard text entry window. Control of editing, such as inserting and deleting, is as delightfully simple as it always is on the Macintosh. When editing is finished, control drops back to the next window and a message appears confirming that all the procedures entered have been defined.

Procedure execution is straight-



Demonstration Logo programs



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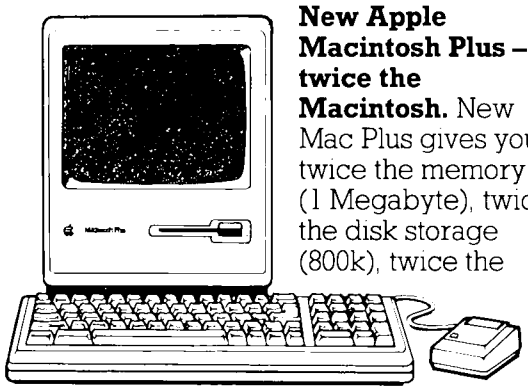

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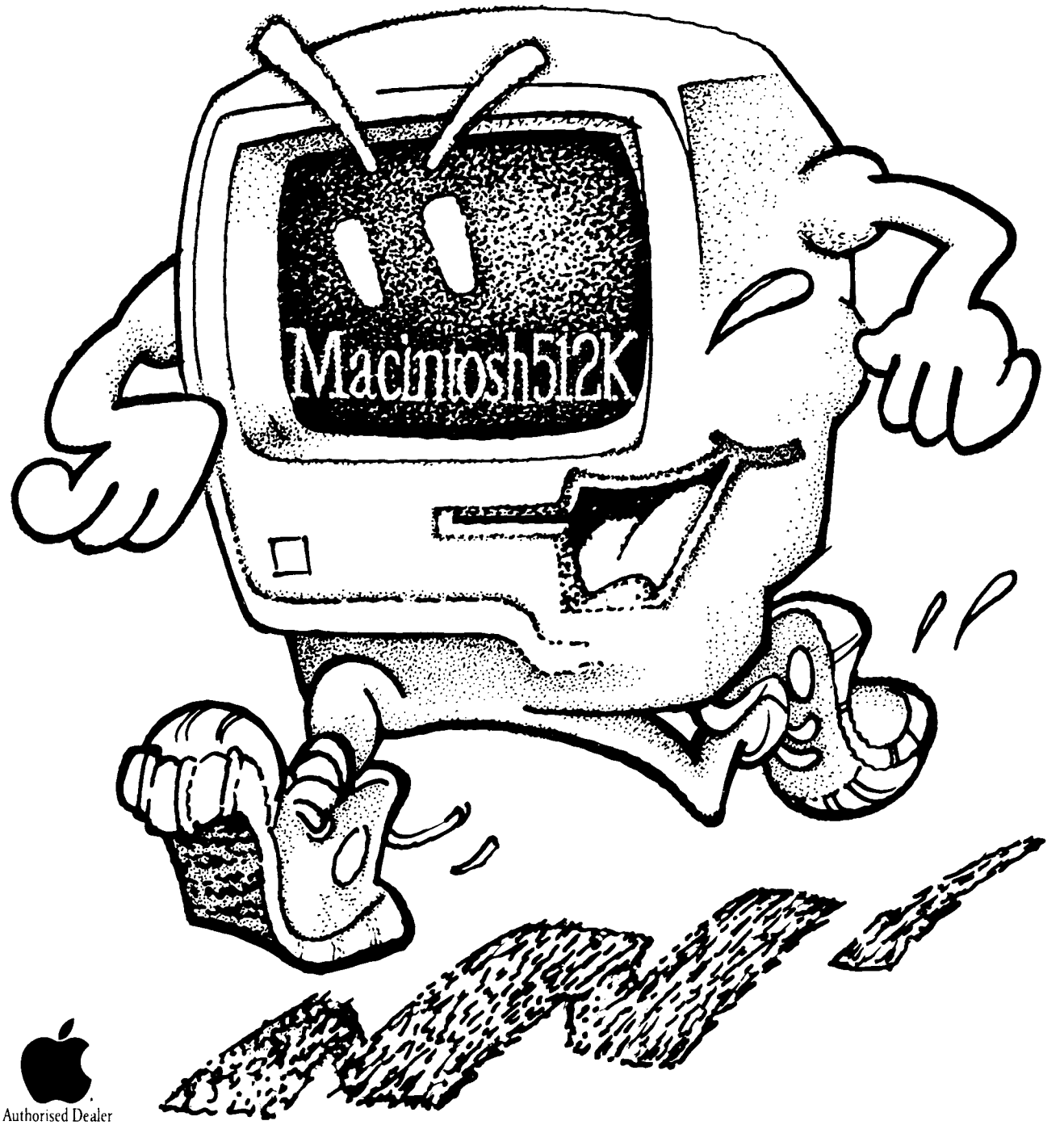

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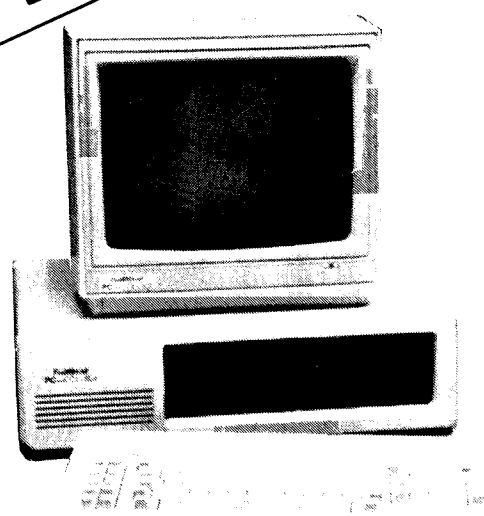

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forward and output is directed to the text or graphic windows as appropriate, and everything is fine until a bug is discovered in the program. I found it very difficult to work out how to use the debugging facilities available, and when they were working I found them extremely unfriendly. Debugging information is directed to a debug window which has to be opened separately. To be of much use, the editor window also needs to be open, showing the listing of the procedure being debugged, and the text and graphics windows should be open to examine output. All these open windows have to be continually moved about and resized while debugging is taking place, which makes the process slow and irritating. It also means that graphics displays are sometimes overlaid and destroyed if another window needs to be expanded.

Interfacing

The most interesting part of exploring the language is finding out how well it interfaces with the Mac's facilities which are not available on other machines. Previous languages such as Mac Pascal and Microsoft Basic have done this very well, and I had great hopes. A look through the manual convinced me that a comprehensive attempt has been made, apart from one glaring omission — pull-down menus. As a test of windows, graphics and mouse control, I wrote a simple, quick painting program which used a small oval brush shape. All it did was check that the cursor (controlled by the mouse) was in the graphics window. If it was and the mouse button was pressed, then a small black oval was drawn at the cursor position. The program then looped around. The program was approximately 10 lines in length and worked perfectly after some debugging of the graphic window.

Microsoft Logo's new, extra graphics commands allow the following facilities: choosing fonts and patterns; designing patterns; setting plotting width; drawing lines and shapes; filling; and changing cursor shape and font styles. These all worked as expected and quickly.

The new window commands are very interesting. Windows are set up as text or graphics and each has to be named; output can then be directed to any open window by giving the name. Commands are available to convert between whole screen coordinates and those within a particular graphics window. Windows can be moved and resized under program control as well as saved to and loaded from disk. Mouse commands are as expected, with the cursor/pointer tied to the mouse position and primitives to check the state of the button and the window the cursor is in. Logo primitives are basic commands within the language and are, effectively, automatically-defined procedures.

Surprisingly, considering Logo's educational bent and the fact that it makes no claims to being a serious systems programming language, the disk access and filing commands are extensive. They allow the complete construction of things such as disk-based random access databases, and in some ways this makes sense considering Logo's underrated potential as a list processing language.

The available workspace management commands include some to control which disks are in the Macintosh, to remove comments from procedures and to hide procedures from view, as well as the usual ones to show contents of the workspace and to tidy it up.

Apart from the usual variable assignment commands, Macintosh Logo also fully covers properties. Any Logo word can have a property list associated with it (a property list is a list of attributes and values which are associated with a particular name). For example, Fred (hair black eyes blue weight 73kg shoe 9) is an obvious property list associating the given values with the name Fred. A full set of primitive procedures is implemented to control and access these property lists.

An additional data type is allowed in Micosoft Logo: this is the array. One qualm I have always had regarding Logo is that it does not have a data structure like an array where data can be stored and retrieved extremely quickly, without having to look for it as with lists. An array in Microsoft Logo is, effectively, a list which has a specific number of elements. Elements of the array are accessed by their position within the array. It is also possible to convert a list into an array and *vice versa*. Some of the operations that apply to lists can also be applied to arrays, such as Count, MemberP, EmptyP, and so on.

One interesting addition to the mathematical calculations that can be performed are the commands Annuity and Compound which calculate annuities and compound interest. These are available presumably because they are part of the libraries available to Macintosh software developers.

Documentation

The documentation accompanying Microsoft Logo is extensive and thorough. The *Guide to Programming* manual is really a guide to programming in Logo, with specific emphasis on the Macintosh and Microsoft Logo. Novice Logo users should find it an easy introduction to the language and this particular implementation.

The other main guide is the Logo *Reference Manual* which gives all the definitive answers. It is useful for people who know Logo and who simply require the finer details of how it operates.

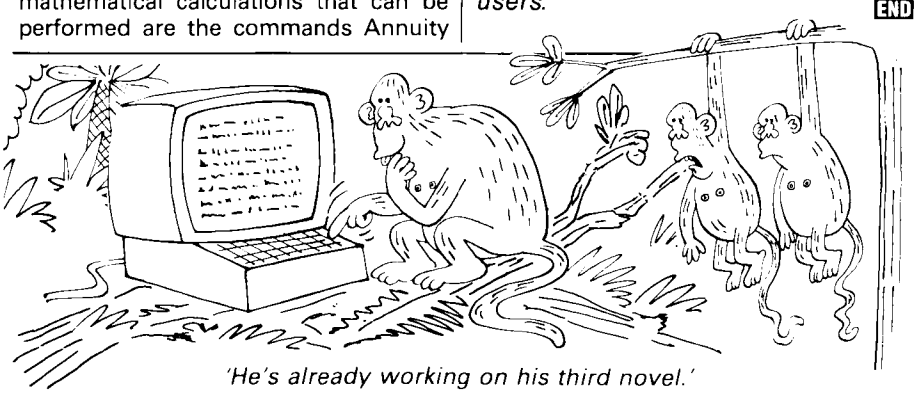
Conclusion

Microsoft Logo is a powerful version of Logo, and has many facilities which make use of the capabilities of the machine on which it runs, the Apple Macintosh. It is suitable for people who wish to learn Logo or who wish to program in the language more seriously. Its structure conforms closely to previous standards, except in one detail — the use of the IF command.

Nevertheless, the interface with the user and the interface between the language and the machine are not as good as they could, and should, be. Experienced Macintosh users may find the language clumsy, although those new to it may not notice anything untoward. The package is rather expensive, even for educational users, although for those who want a comprehensive version of Logo with access to considerable power and memory, there is little to compete with it.

Microsoft Logo is available from Microsoft or its dealers at a retail price of $259, discounted to approximately $140 for educational users.

END



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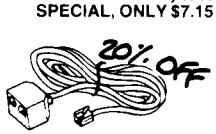

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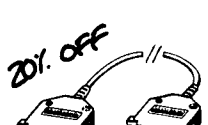

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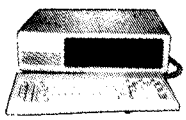

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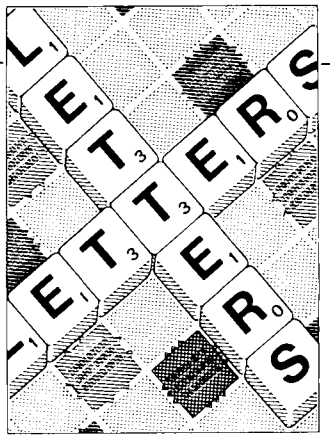

LETTERS

This is the chance to air your views — mail to 'Letters', Australian Personal Computer, 2nd floor, 215 Clarence Street, Sydney 2000. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.

Starting something

I see that *APC* has published two pages of one person's political outlook on the world under the thin guise of a treatise on the responsibilities of the computer industry ('The computer strikes back', March). The problem with this approach is that there are going to be replies from people who disagree with the facts as stated because: (a) they see the facts as erroneous in some respects and in need of correction; or (b) they disagree with the political standpoint of the author and are about to use precisely the same facts to disprove the argument.

I hope that I belong to the first category.

Communications are *already* a vitally important part of the defence environment. The Joint Tactical Information and Distribution System (JTIDS) is already in existence. It allows ships, aircraft and troops to share and contribute to the information gathered by various sensors. For example, an aircraft usually has only the information, gathered by its radar, available to it regarding the disposition of targets. As a rough rule, it only knows what is going on ahead of it, as that is the area being swept by the radar. JTIDS means that this radar information is available on the displays of other aircraft in the vicinity, and that their information is available on the subject's display. Typically, a pilot/navigator on a suitably-equipped fighter will be aware of targets in front and behind, which targets are at present unchallenged by defence forces and which targets are being actively engaged. Naturally, specially-built aircraft like AWACS are likely to be the biggest information providers to the network. The displays are not 'raw' data directly from the radar, but 'synthetic', having been processed by the radar's built-in computer to provide a symbolic representation of the threats.

There are many examples of computer-controlled communications networks which are not open to the likes of Mike Scialom and myself (even with 1200-baud modems) because we are irrelevant to their operation. Just because the names are not published each month in 'Communications' does not mean that the world at large is backward in the communications field. Arpanet has been up and running for a long time in the US, and has been held up as a good example of a communications net between US universities and other institutions, but the name is derived from the US Defense Advanced Research Projects Agency. There is also 'Wimex' (properly WWMCCS, the Worldwide Military Command and Control System). These and others are all communications networks which are up and running and in everyday use. The whole field of data collection, analysis and dissemination is known as Command, Control, Communications and Intelligence, or C^3I.
The airborne control and command centres are C-135s (Boeing 707s with lots of bolt-on goodies) known rather aptly as 'Silk Purse'. As they come into their own when the missiles are flying and the ground is no longer a safe place to be, no doubt they are indeed trying to make silk purses out of a lot of pigs' ears.
P Hardy

Mounting horror

I read with mounting horror Mike Scialom's piece on the Strategic Defence Initiative in the March issue of *APC* ('The computer strikes back'). Beginning with the pointed observation that Star Wars has 'stimulated little public debate within the scientific or computing fraternities', and the even more pointed thesis that 'Star Wars is showing the West to be bankrupt — of morality and true vision', the article manages to conclude that SDI represents a 'chance in a million' that 'the scientific — and especially the computing — establishment' will ignore at its peril.

Two assumptions seem to guide his argument. On the one hand, that the objective of the Star Wars programme is exhausted by Reagan's vision of a nuclear-free and totally defensive security strategy. On the other, that speaking (I presume) as a member of the computing fraternity, Mike Scialom thinks that the whole issue can be approached solely from the point of view of the benefits that will occur to it — at least, that is, to its American division.

It is patently *not* the case that Star Wars will be developed at the expense of the offensive American nuclear arsenal — let alone that of the West; France in particular has shown no signs of winding down its offensive nuclear weapons programmes.

The basic problem with Star Wars is that it will not be a perfectly functioning system, a hypothesis that Mike himself considers possible. The '100 per cent accuracy' which will be required if the thing is to work, is truly a 'pipedream'. If the (relatively speaking) simplistic system and software which we work with today can never be fully debugged, how many more unwitting errors will, for example, the hypothesised 10 million lines of code required for Star Wars contain?

Clearly, some of the bugs will cause no more than hiccoughs; but what about the others? My own imagination boggles.

More importantly, the politicians and military personnel who now constitute the moving force behind Star Wars are well aware of the fact, and a less ambitious defence is envisioned which will not do away with offensive weaponry.

And what about the Soviets? There is no indication in the article that Mike is aware of their antagonism to Star Wars, let alone informed as to the reasons why. Simply put, the Soviets see Star Wars as the most ambitious attempt yet by the Americans to re-establish global strategic superiority and, ultimately,

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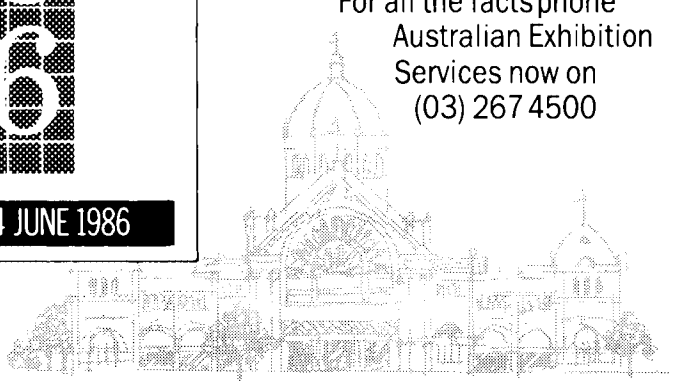

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economic and political hegemony.

Herein lies the cause of the chorus of 'No!'s which Mike finds so astonishing. Once the mind goes beyond the particular jobs which the high-tech industry will reap from the financial bonanza of Star Wars, it simultaneously revolts at the concept.

Let me thank Mike for opening the debate in *APC*. I am sorry that I cannot agree more with his prospectus. Assuredly, let us make research money available to the scientific and computing establishments; definitely, let the politicians provide challenges for all involved so that 'scientists of real stature and merit — perhaps genius' *can* come forward; finally, let us make sure that our educational institutions are up to the challenges. But rather than centring all this on the development of military technology in the hope that civilian spin-offs will result, why not focus on the problems that are of direct concern to society worldwide? Lord knows, we have enough of them.

R Banks

The author strikes back

In his article 'The computer strikes back' (*APC*, March), Mike Scialom raises the very important subject of the Star Wars programme, but he seems to be unaware of the dangers inherent in this programme.

The two main arguments raised in the article in support of Star Wars are that it will lead to important advances in computer technology which will benefit mankind in general while offering, however small, a chance to eliminate the nuclear threat that hangs over the world. I would agree that the project will lead to many technological advances, but these will be more costly in relation to their benefits to the civilian economy than direct investment in civilian technology (including computers).

Most important, though, is the fact that Star Wars will be a destabilising programme: that is, it will increase, not decrease, the threat of nuclear war. This is because it is an attempt to create a large-scale anti-ballistic missile (ABM) system, banned under the 1972 ABM treaty. The creation of a large-scale ABM system would give the nation that possessed it the ability to use, or threaten to use, nuclear weapons without itself being threatened by a retaliatory strike. Therefore, the only possible Soviet response to the programme, if it is implemented, is to develop weapons to penetrate the Star Wars shield and quite possibly develop a similar ABM system as well, so as to ensure its own (and its allies') security. It should be noted that the Star Wars programme is not non-nuclear, as often claimed, but in fact includes the development of nuclear-powered laser, the X-ray laser. Nor is it entirely defensive: weapons to be developed in the programme have capabilities to hit orbiting satellites, and possibly ground-based targets as well.

The way to eliminate the nuclear threat and also help accelerate technical progress to the benefit of mankind is by political measures. The recent Soviet offer made by Mr Gorbachev, to eliminate all nuclear weapons by the year 2000, offers an excellent framework for a future without nuclear weapons. This will also allow the funds at present wasted on weapons to be better spent on peaceful developments to the benefit of all humanity.

D Clark

Time warps

As G Sutherland revealed in 'Letters', *APC* March, the Japanese unit of time is different to that commonly used in Sydney. The reason for this is quite straightforward — continental drift (or plate centronics, as it is called by printer manual writers).

Japan's position on the west side of the Pacific means that it suffers from an extreme rate of drift of a somewhat unpredictable nature. To keep pace with this, the East Perceived Second of Nippon was devised. This is the same as the internationally recognised GMT unit except in November, when a correction term is added to compensate for the year's westward drift through the world's time zones. November was chosen so as to boost the Christmas watch sales, which explains the Japanese domination of the market.

The wily Japanese have, of course, taken full advantage of their nation's peculiar motions. In war, a fatal error of navigation led the Russian fleet to disaster in the Russo-Japanese war at the turn of the century, and the fall of Singapore has been attributed to the speed of the Japanese advance. In peace, all measures of speed and productivity are made in November, so giving a totally false picture (witness the 'bullet train').

The Japanese 'miracle', however, is coming to an end. Western leaders increasingly talk of Japan 'catching up with' the US (although few realise they are talking of time zones). Trade agreements usually require the unit of time to be prominently displayed on the product; worst of all, Japan is expected to collide with its communist neighbours in the year 2001. It is doubtful if China and the Soviet Union would survive the impact.

M Webster

'That's the third time he's nearly finished reconciling the year's accounts and somebody switched on the electric kettle'.

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It gets better

In response to Phil Cohen's review of The Word Machine in March *APC*, I would like to make several points.

Idea processors do have a role as a specialist tool for outlining large complex documents. For short documents pen and paper are usually quite adequate. The Word Machine also has a more general application as a display tool.

Mr Cohen criticised The Word Machine's speed. I must concede that overwriting and screen refresh are slower than a word processor. The reason for this slowness will become more apparent, and its importance less significant when The Word Machine is empowered with an inference engine later this year.

The text compression and linking process developed by Troll compiles all incoming text into a matrix of links. This inevitably slows down editing. The design criteria used was that text could be entered at burst speeds greater than 150 words per minute. This was exceeded. When writing to the screen, each word is looked up in a dictionary to find its ASCII representation. The design criteria used here was that it should exceed the 1200 bps rate familiar to mainframe and network users, and it does.

I am not aware of any comparable system that achieves such high information density or is capable of runtime editing and decompilation, let alone at the speeds we have achieved.

The difficulty with typing "P" and "@" symbols on the Apple II+ has fortunately been remedied on the IIe/c keyboards. In any event, typing capital "P" does not produce a mode change. The RESET key is a natural choice for restoring the last saved position. I apologise to any users who have been inconvenienced by the obscurity of the reference to this function in the manual.

Troll has provided all interested Australian Apple dealers with a demonstration disk enabling potential customers to assess the product according to their needs. All registered users have been sent a copy of The Word Machine, Version 1.2.

Our pre-launch testing is being upgraded with the assistance of Word Machine users and others. We welcome applications from potential users interested in taking part in the inference engine beta-test program.

D Davies
Technical Director
Troll Microsoftware

Although the speed of the package might be good enough to meet its specifications, it's still too slow for users.

I look forward to seeing the inference engine version and wish you good luck with it.
Phil Cohen

Jap time

With reference to G Sutherland's letter in March *APC*, the difference in printing speed is due to the difference in mains or line frequency at which the printing speeds were determined. The Japanese (and American) line frequency is 60Hz, Oz's is 50Hz.

The ratio is 0.8333 or put in other words, the motors in the printers run 17% slower in Australia than in Japan.

The variation between different printer configurations is due to the variation in the amount of time that drive motors are involved. The higher the percentage of time that is involved in moving paper or heads by motors versus the time in actual printing the greater the discrepancy.

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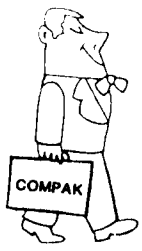

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Philip Fedman

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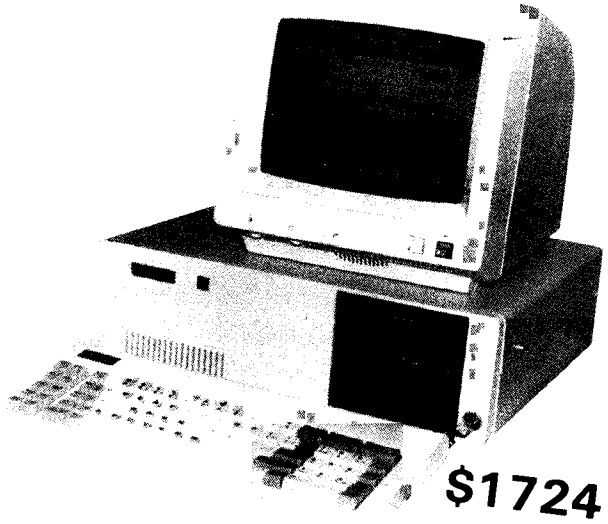

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Processing speech

Before you spend money on a commercial speech unit, how about trying to construct one at home? Paul Hardy, armed with a soldering iron and allophones, is your guide.

Having seen some commercial speech units for the Commodore 64, I decided to make something for my CP/M system. As I was interested in the concept of a talkative micro rather than a complex construction project, it had to be cheap, and both easy and fast to make.

The unit I came up with uses less than 20 discrete components and cost around $40 to build. It took me a couple of hours to make, and should be well within the capabilities of anyone who can handle a soldering iron and CMOS ICs. To make life even simpler, a printed circuit board has been designed for the project. The unit will work on any machine which has a parallel printer port, CP/M-based or not.

Allophones & phonemes

Before moving on to the construction details, a brief look at phonemes and allophones is necessary. A phoneme is a language sound defined by the way the human mouth is used to construct it. The 's' in 'snow', for example, is a phoneme; specifically, an alveolar voiceless fricative. 'Alveolar' means the tip of the tongue touches or nearly touches the Alveolar Ridge, which is the bit of upper jaw just behind the top teeth. It is voiceless because the vocal cords are not being used to make a sound. The voiced phoneme is the 'z' in 'zoo'; this time, the vocal cords are making a sound.

Each language has a phoneme set which is slightly different from those in any other language. A speech processor with a look-up table of phonemes could be expected to successfully generate any desired word. However, this is not so as, despite the apparently accurate definition of the mechanics used in making the phoneme, a phoneme which occurs twice in a word may sound rather different in each position, due to the sounds around it. Each of these different-sounding phonemes is an 'allophone': the sounds are allphones of the same phoneme. An allophone, therefore, sounds the same wherever it is. With enough allophones, it should be possible to fairly accurately reproduce any word. The allophones are defined by how they sound rather than the mechanism used to make them.

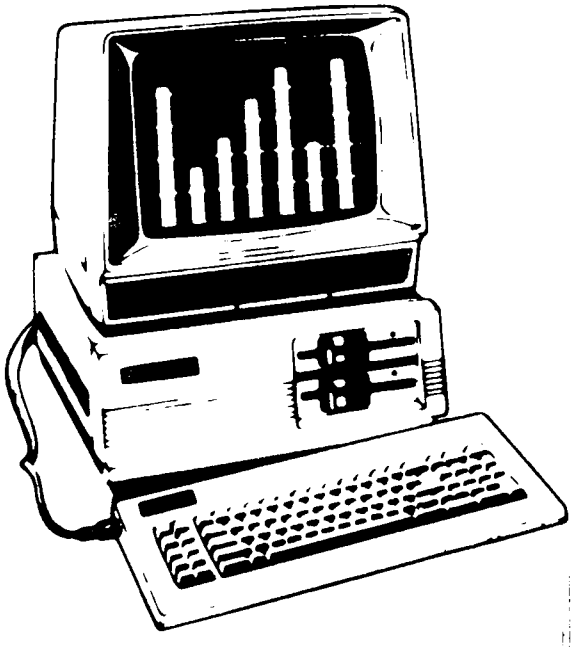
This speech processor unit has an allophone set on ROM as a set of 59 allophones and five pauses. The pauses are of various lengths from 10ms to 200ms, and are important tools in forming words accurately. For example, a short pause before the consonants B, D and G is needed to allow the sound to appear 'true' to the ear.

The allophone set on the chip I used, the SP0256AL, contains two or three versions of some phonemes. These tend to be varying-length consonants such as DD1 and DD2, as one will sound better than the other in any particular location. To create a long initial sound, for example a sibillant 's', there is nothing wrong with repeating the same allophone a couple of times. This can only be done with

Address (Decimal)	Word Nr	Allophone	Duration (millisec)	Example
0	64	PA1	10	(pause)
1	1	PA2	30	(pause)
2	2	PA3	50	(pause)
3	3	PA4	100	(pause)
4	4	PA5	200	(pause)
5	5	/OY/	420	boy
6	6	/AY/	260	sky
7	7	/EH/	70	end
8	8	/KK3/	120	comb
9	63	/PP/	210	pow
10	10	/JH/	140	dodge
11	11	/NN1/	140	thin
12	12	/IH/	70	sit
13	13	/TT2/	140	to
14	14	/RR1/	170	rural
15	15	/AX/	70	succeed
16	16	/MM/	180	milk
17	17	/TT1/	100	part
18	18	/DH1/	290	they
19	19	/IY/	250	see
20	20	/EY/	280	beige
21	21	/DD1/	70	could
22	22	/UW1/	100	to
23	23	/AO/	100	aught
24	24	/AA/	100	hot
25	25	/YY2/	180	yes
26	26	/AE/	120	hat
27	27	/HH1/	130	he
28	28	/BB1/	80	business
29	29	/TH/	180	thin
30	30	/UH/	100	book
31	31	/UW2/	260	food
32	32	/AW/	370	out
33	33	/DD2/	160	do
34	34	/GG3/	140	wig
35	35	/VV/	190	vest
36	36	/GG1/	80	got
37	37	/SH/	160	ship
38	38	/ZH/	190	azure
39	39	/RR2/	120	brain
40	40	/FF/	150	food
41	41	/KK2/	190	sky
42	42	/KK1/	160	cannot
43	43	/ZZ/	210	zoo
44	44	/NG/	220	ding
45	45	/LL/	110	lake
46	46	/WW/	180	wool
47	47	/XR/	360	repair
48	48	/WH/	200	whip
49	49	/YY1/	130	yes
50	50	/CH/	190	church
51	51	/ER1/	160	fir
52	52	/ER2/	300	fir
53	53	/OW/	240	hoe
54	54	/DH2/	240	they
55	55	/SS/	90	vest
56	56	/NN2/	190	no
57	57	/HH2/	180	hoe
58	58	/OR/	330	store
59	59	/AR/	290	arm
60	60	/YR/	350	clear
61	61	/GG2/	40	guest
62	62	/EL/	190	saddle
63	63	/BB2/	50	business

Fig 1 Allophones, listed by ROM address and location in the vocabulary file VOCABUL.RY, generated by routine FILELOAD.BAS

To:— Tom, Dick & George



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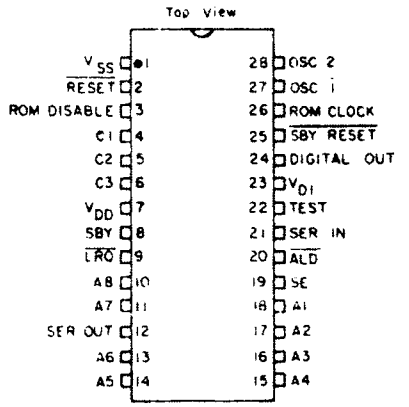

Pin	Name	Function
1	VSS	Ground (0V)
2	RESET	Must be logic 1 for normal operation
3	ROM DISABLE	Disables external ROMs when at logic 1. Unused.
4	C1	Control lines for external ROMs Unused.
5	C2	
6	C3	
7	VDD	Power supply (5V)
8	SBY	STANDBY. Goes to logic 0 when an address has been loaded, then returns to logic 1. Used by this project.
9	LRQ	LOAD REQUEST. Goes to logic 1 whenever the input buffer is full. Returns to logic 0 when the burrer is empty. Used by this project.
10	A8	The 8 address lines. Used.
11	A7	
13	A6	
14	A5	
15	A4	
16	A3	
17	A2	
18	A1	
12	SER OUT	SERIAL ADDRESS OUT. Used to address external ROMs. Unused.
19	SE	STROBE ENABLE. Tied to logic 1 for mode 1 operation. See text.
20	ALD	ADDRESS LOAD. When pulsed low by 'STROBE' from the micro, the 8 address bits A1 to A8 are loaded and LRQ goes high.
21	SER IN	SERIAL IN. Serial data input from an external speech ROM. Unused.
22	TEST	Tied to ground (0V).
23	VD1	Power supply.
24	DIGITAL OUT	Digital speech output, pulse width modulated. Used as an audio signal after filtering through a 5kHz low-pass filter.
25	SBY RESET	Tied to logic 1 for normal operation.
26	ROM CLOCK	A clock output, half the frequency of the crystal oscillator on pins 27 and 28. Would be use to drive external speech ROMs but unused here.
27	OSC1	The connections to the oscillator which determines the voice pitch and speed.
28	OSC2	

Diagram 1 SP0256AL2 integrated circuit

the fricatives and short vowels, as the sounds are relatively 'pure': they sound the same at the end as at the beginning, and so stringing them together makes the same sound last longer. A 'complex' allophone which undergoes a tonal change during its use — for example, the /OW/ representing the 'o' in 'zone' — can't be doubled, as you then get a distinct 'o-o' rather than a longer version of the original sound.

The sounds which require pauses before them (PP, TT, DD, KK, GG, CH and JH) do, in fact, have very short pauses built into them, but trial and error might indicate the need for additional pauses. Word design is subjective. A word that is difficult to generate and sounds 'false' when spoken alone, might be perfectly acceptable when sounded as part of a sentence. This is due to the brain not needing all the aural information being fed to it, and when it grasps what is being said, any missing bits are filled in and extraneous bits are ignored. The frequency response of the brain is about 50Hz to 20KHz, which is why hi-fis are designed with the same frequency response; any more is wasted. On the other hand, the frequency response of the telephone network is up to about 5KHz. It obviously isn't hi-fi, but it is readily understandable. This speech processor has roughly the same frequency response.

The allophone set in this IC is, in effect, 59 sounds snipped out of a large set of spoken words (Fig 1). These sounds were 'snipped' in the United States. I mentioned earlier that no two languages have precisely the same phoneme set; this is true of Australian and American. The result is that it is very difficult to stop the speech processor sounding like an American shouting down the telephone. If you accept this, then word design becomes much easier.

The processor

The single SP0256AL2 integrated circuit is an MOS LSI device in a 28-pin package (Diagram 1). It consists of four basic sections:

— a software-programmable digital filter which models the vocal tract;

— a 16k ROM holding the program and the data;

— a processor which uses the program and data to control a digital filter; and

— a pulse width modulator which creates the digital output. The output is passed through an external low-pass filter to form the audio signal.

The SP0256AL2 needs an external

ICI SPO256-AL2

Resistors 0.25W 5 per cent carbon film

R1-R6	10k
R7	100k
R8, R9	33k

Capacitors

C1, C2	22pF ceramic plate
C3, C6	100nF dipped polyester
C4, C5	22nF dipped polyester
C7	47uF electrolytic

Diodes

D1	1N4148
D2	1N4001

Miscellaneous

20-pin IC socket
Centronics socket, 90-degree PCB mounting type
Four two-way PCB mounting terminal blocks
Printed circuit board

Fig 2 Parts list

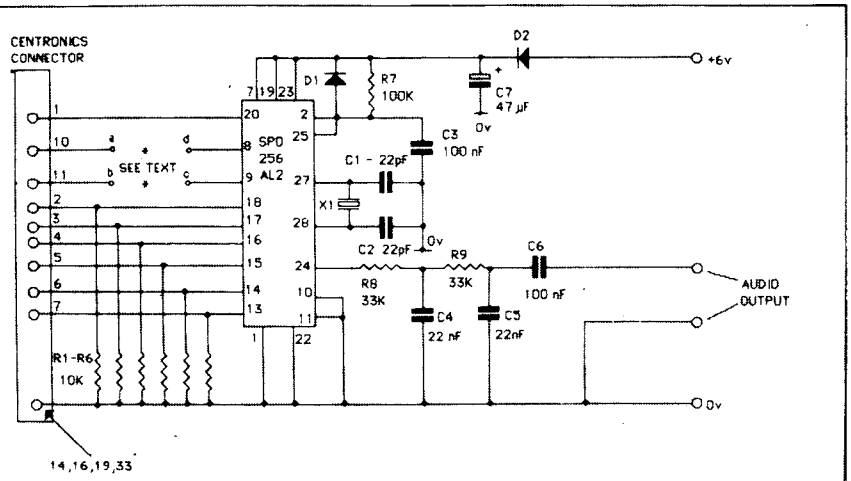

Diagram 2a Speech synthesiser circuit

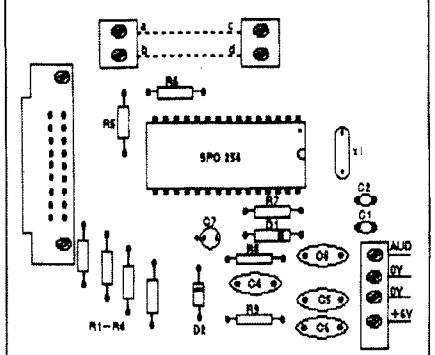

Diagram 2b Overlay diagram

```
10 REM ====)  SPEAK.BAS copyright (c) 1985 by Paul Hardy
20 REM ====)  Says "Hello, I am talking to you."
30 REM ========================================================================
40 REM
50 CLEAR 2000  :  DEFINT A-Z
60 REM =====)  Note that /PP/ will not work in an LPRINT statement
70 REM =====)  because it is the 'tab' character:  see text.
80 REM
90 PA1=0 : PA2=1 : PA3=2 : PA4=3 : PA5=4 : OY=5 : AY=6 : EH=7 : KK3=8 : PP=9 :
   JH=10 : NN1=11 : IH=12 : TT2=13 : RR1=14 : AX=15 : MM=16 : TT1=17
100 DH1=18 : IY=19 : EY=20 : DD1=21 : UW1=22 : AO=23 : AA=24 : YY2=25 : AE=26 :
    HH1=27 : BB1=28 : TH=29 : UH=30 : UW2=31
110 AW=32 : DD2=33 : GG3=34 : VV=35 : GG1=36 : SH=37 : ZH=38 : RR2=39 : FF=40 :
    KK2=41 : KK1=42 : ZZ=43 : NG=44 : LL=45 : WW=46 : XR=47 : WH=48 : YY1=49
120 REM
130 REM =====)  NOTE allophone /OR/ is written as OOR to avoid a clash with
140 REM =====)        the reserved word OR.
150 REM
160 CH=50 : ER1=51 : ER2=52 : OW=53 : DH2=54 : SS=55 : NN2=56 : HH2=57 : OOR=58
    : AR=59 : YR=60 : GG2=61 : EL=62 : BB2=63
170 LPRINT CHR$(HH); CHR$(EH); CHR$(LL); CHR$(AX); CHR$(OW); CHR$(PA5);
           CHR$(PA5);  : REM   hello
180 LPRINT CHR$(AA); CHR$(AY); CHR$(PA3);  : REM  I
190 LPRINT CHR$(AX); CHR$(AX); CHR$(MM); CHR$(PA3);  : REM  am
200 LPRINT CHR$(TT2); CHR$(AO); CHR$(AO); CHR$(KK1); CHR$(IH); CHR$(NG);
           CHR$(PA3);  : REM  talking
210 LPRINT CHR$(TT2); CHR$(UW2); CHR$(PA3);  : REM to
220 LPRINT  CHR$(YY2); CHR$(UW2); CHR$(PA3);  : REM you
230 LPRINT CHR$(PA5); CHR$(PA5); CHR$(PA5);  : REM (pause)
```

Listing 1 HELLO.BAS

processor (a micro) to concatenate the separate sounds. It has eight address lines which are loaded with the address of the sound to be made. There are 64 sounds stored in the ROM (or, more accurately, 59 sounds and five pauses) numbered 0 to 63.

This means that it should be possible to address all the locations using just six address lines (in fact, the two highest address lines are not required). This sounds rather complicated, but is not: it acts like a parallel printer and so can be treated as such by the software.

The IC can be addressed in two modes. Mode 0 does not require the ALD pin to be strobed, but simply waits for any address line to go high. The problem is that it isn't possible to make the sound associated with location 0, as all address lines are then low. This is a 10ms pause, and as there are four other pauses available of differing lengths, it may not be missed.

Mode one (which the project uses) requires the address to be loaded, and then the address load pin (ALD) to be pulsed low. This is exactly what a printer expects. When the address is loaded and the ALD pin strobed (many printer manuals call the pin 'Strobe'), the speech processor sets Load Request (LRQ) high to signal that the input buffer is full, and Standby (SBY) low to signal that the processor is now busy. Either signal can be used.

The speech processor therefore behaves like a parallel printer with a very small input buffer. As the shortest sound it makes lasts 10ms, the controlling software does not have to run very fast: if the software can supply it at a leisurely 100Hz, it will never run out of things to say. It should be possible to construct sentences within Basic and output

A	115	D	118	G	121	May	107	robots	177	thirteen	78
alarm	141	date	154			memory	169			thirty	86
April	106	daughter	155	H	122	million	95	S	133	thousand	94
ate	73	day	156	hello	161	minute	170	Saturday	102	three	68
August	110	December	114	hour	162	Monday	97	score	178	Thursday	100
				hundred	93	mouth	171	sea	117	time	187
B	116	E	119					second	173	times	188
be	116	eight	73	I	123	N	128	seconds	180	to	67
bee	116	eighteen	83	infinitive	163	nine	74	see	117	too	67
beer	142	eighty	91	investigate	164	nineteen	84	September	111	Tuesday	98
bread	143	eleven	76	investigator	165	ninety	92	seven	72	twelve	77
buy	144	escape	157	investigators	166	no	172	seventeen	82	twenty	85
by	144	equal	158			November	113	seventy	90	two	67
		equals	159	J	124			sister	181		
C	117	error	160	January	103	O	129	six	71	U	135
calendar	145			July	109	October	112	sixteen	81		
clock	146	F	120	June	108	one	66	sixty	89	V	136
clown	147	February	104					start	182		
check	148	fifteen	80	K	125	P	130	stop	183	W	137
checker	149	fifty	88			plus	173	Sunday	96	Wednesday	99
cheque	148	five	70	L	126						
computer	150	for	69	letter	167	Q	131	T	134	X	138
correct	151	forty	87	little	168			talk	184		
corrected	152	four	69			R	132	talking	185	Y	139
correcting	153	fourteen	79	M	127	ready	174	talks	186	year	189
		Friday	101	March	105	red	175	tea	134	yes	190
						robot	176	ten	75		
										Z	140
										zero	65

Fig 3 Word numbers

Multisoft News

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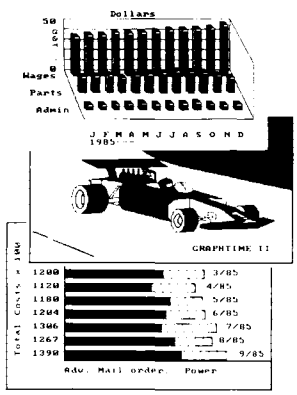

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```
10' ' ==========================================================
20 ' =====) FILELOAD.BAS copyright (c) Paul Hardy.          ==
30 ' =====) Program creates a random-access disk file      ==
40 ' =====) and loads it with the speech vocabulary.       ==
50 ' =====)                                                ==
60 ' =====) The program may be used for personal,          ==
70 ' =====) non-commercial purposes only.                  ==
80 ' =====)                                                ==
90 ' ==========================================================
100 '
110 OPTION BASE 1                       :' Start arrays at 1, not 0
120 WIDTH 255                           :' Allow longer MBASIC lines
130 '
140 ' =====) Array A can hold 200 words of 19 allophones
150 ' =====) plus one location for word length.
160 '
170 DIM A(20)
180 TOP=190                                     :' Number of words
190 '
200 DATA 1,1                                    :' PA2
210 DATA 1,2                                    :' PA3
220 DATA 1,3                                    :' PA4
230 DATA 1,4                                    :' PA5
240 DATA 1,5                                    :' /OY/
250 DATA 1,6                                    :' /AY/
260 DATA 1,7                                    :' /EH/
270 DATA 1,8                                    :' /KK3/
280 DATA 1,63                                   :' /PP/ (-SEE TEXT
290 DATA 1,10                                   :' /JH/
300 DATA 1,11                                   :' /NN./
310 DATA 1,12                                   :' /IH/
320 DATA 1,13                                   :' /TT2/
330 DATA 1,14                                   :' /RR1/
340 DATA 1,15                                   :' /AX/
350 DATA 1,16                                   :' /MM/
360 DATA 1,17                                   :' /TT1/
370 DATA 1,18                                   :' /DH1/
380 DATA 1,19                                   :' /IY/
390 DATA 1,20                                   :' /EY/
400 DATA 1,21                                   :' /DD1/
410 DATA 1,22                                   :' /UW1/
420 DATA 1,23                                   :' /AO/
430 DATA 1,24                                   :' /AA/
440 DATA 1,25                                   :' /YY2/
450 DATA 1,26                                   :' /AE/
460 DATA 1,27                                   :' /HH1/
470 DATA 1,28                                   :' /BB1/
480 DATA 1,29                                   :' /TH/
490 DATA 1,30                                   :' /UH/
500 DATA 1,31                                   :' /UW2/
510 DATA 1,32                                   :' /AW/
520 DATA 1,33                                   :' /DD2/
530 DATA 1,34                                   :' /GG3/
540 DATA 1,35                                   :' /VV/
550 DATA 1,36                                   :' /GG1/
560 DATA 1,37                                   :' /SH/
570 DATA 1,38                                   :' /ZH/
580 DATA 1,39                                   :' /RR2/
590 DATA 1,40                                   :' /FF/
600 DATA 1,41                                   :' /KK2/
610 DATA 1,42                                   :' /KK1/
620 DATA 1,43                                   :' /ZZ/
630 DATA 1,44                                   :' /NG/
640 DATA 1,45                                   :' /LL/
650 DATA 1,46                                   :' /WW/
660 DATA 1,47                                   :' /XR/
670 DATA 1,48                                   :' /WH/
680 DATA 1,49                                   :' /YY1/
690 DATA 1,50                                   :' /CH/
700 DATA 1,51                                   :' /ER1/
710 DATA 1,52                                   :' /ER2/
720 DATA 1,53                                   :' /OW/
730 DATA 1,54                                   :' /DH2/
740 DATA 1,55                                   :' /SS/
750 DATA 1,56                                   :' /NN2/
760 DATA 1,57                                   :' /HH2/
770 DATA 1,58                                   :' /OR/
780 DATA 1,59                                   :' /AR/
790 DATA 1,60                                   :' /YR/
800 DATA 1,61                                   :' /BB2/
810 DATA 1,62                                   :' /EL/
820 DATA 1,63                                   :' /BB2/
830 DATA 1,0                                    :' PA1 (--At the
840 '                   end because the direct access file
850 '                   records start with nr 1
860 '
870 DATA 3,43,60,53                             :' zero
880 DATA 3,46,15,11                             :' one
890 DATA 2,13,31                                :' two, to, too
900 DATA 3,29,14,19                             :' three
910 DATA 3,40,40,58                             :' four, for
920 DATA 4,40,40,6,35                           :' five
930 DATA 7,55,55,12,12,2,41,55                  :' six
940 DATA 6,55,55,7,7,35,11                      :' seven
950 DATA 3,20,2,13                              :' eight, ate
960 DATA 4,11,24,6,11                           :' nine
970 DATA 4,13,7,7,11                            :' ten
980 DATA 7,12,45,7,7,35,12,11                   :' eleven
990 DATA 6,13,48,7,7,45,35                      :' twelve
1000 DATA 7,29,51,1,2,13,19,11                  :' thirteen
1010 DATA 7,40,58,1,2,13,19,11                  :' fourteen
1020 DATA 8,40,12,40,1,2,13,19,11               :' fifteen
1030 DATA 11,55,55,12,2,41,55,1,2,13,19,11      :' sixteen
1040 DATA 11,55,55,7,33,29,11,1,2,13,19,11      :' seventeen
1050 DATA 6,20,1,2,13,19,11                     :' eighteen
1060 DATA 8,11,6,11,1,2,13,19,11                :' nineteen
1070 DATA 9,13,48,7,7,11,1,2,13,19              :' twenty
1080 '
1090 DATA 6,29,52,1,2,13,19                     :' thirty
1100 DATA 5,40,58,2,13,19                       :' forty
1110 DATA 9,40,40,12,40,40,1,2,13,19            :' fifty
1120 DATA 10,55,55,12,2,41,55,1,2,13,19         :' sixty
1130 DATA 10,55,55,7,35,12,11,1,2,13,19         :' seventy
1140 DATA 4,20,2,13,19                          :' eighty
1150 DATA 6,11,6,11,2,13,19                     :' ninety
1160 DATA 11,57,15,15,11,1,33,39,12,12,0,21     :' hundred
1170 DATA 9,29,24,32,43,29,0,0,11,21            :' thousand
1180 DATA 7,16,12,12,45,49,15,11                :' million
1190 '
1200 DATA 8,55,55,15,15,11,1,33,20              :' Sunday
1210 DATA 7,16,15,15,11,1,33,20                 :' Monday
1220 DATA 6,13,31,43,1,33,20                    :' Tuesday
1230 DATA 8,46,7,7,11,43,1,33,20                :' Wednesday
1240 DATA 6,29,52,43,1,33,20                    :' Thursday
1250 DATA 6,40,39,6,1,33,20                     :' Friday
1260 DATA 8,55,55,26,2,13,1,33,20               :' Saturday
1270 DATA 7,10,26,26,11,25,47,19                :' January
1280 DATA 9,40,7,7,0,28,39,31,47,19             :' February
1290 DATA 4,16,59,2,50                          :' March
1300 DATA 7,20,2,63,39,12,12,45                 :' April
1310 DATA 2,16,20                               :' May
1320 DATA 3,10,31,11                            :' June
1330 DATA 4,10,22,45,6                          :' July
1340 DATA 8,23,23,1,61,15,55,2,17               :' August
1350 DATA 12,55,55,7,2,63,2,13,7,7,0,63,51      :' September
1360 DATA 9,24,1,41,2,13,53,0,63,51             :' October
1370 DATA 9,56,53,35,7,7,16,0,63,51             :' November
1380 DATA 10,33,19,55,55,7,7,16,0,63,51         :' December
1390 '
1400 DATA 1,20                                  :' A
1410 DATA 2,63,19                               :' B, be, bee
1420 DATA 3,55,55,19                            :' C, sea, see
1430 DATA 2,33,19                               :' D
1440 DATA 1,19                                  :' E
1450 DATA 4,7,7,40,40                           :' F
1460 DATA 2,10,19                               :' G
1470 DATA 4,20,1,2,50                           :' H
1480 DATA 2,24,6                                :' I
1490 DATA 3,10,7,20                             :' J
1500 DATA 3,42,7,20                             :' K
1510 DATA 3,7,7,62                              :' L
1520 DATA 3,7,7,16                              :' M
1530 DATA 3,7,7,11                              :' N
1540 DATA 1,53                                  :' O
1550 DATA 2,63,19                               :' P
1560 DATA 3,42,49,31                            :' Q
1570 DATA 1,59                                  :' R
1580 DATA 4,7,7,55,55                           :' S
1590 DATA 2,13,19                               :' T, tea
1600 DATA 2,49,31                               :' U
1610 DATA 2,35,19                               :' V
1620 DATA 7,33,15,1,63,62,49,31                 :' W
1630 DATA 6,7,7,2,41,55,55                      :' X
1640 DATA 2,46,6                                :' Y
1650 DATA 5,43,7,7,1,21                         :' Z (English one!)
1660 '
1670 DATA 4,15,45,59,16                         :' ALARM
1680 DATA 2,63,60                               :' BEER
1690 DATA 6,28,39,7,7,0,21                      :' BREAD
1700 DATA 3,63,24,6                             :' BY, BUY
1710 DATA 9,42,26,26,45,7,11,1,33,51            :' CALENDAR
1720 DATA 6,42,45,24,24,2,41                    :' CLOCK
1730 DATA 4,42,45,32,11                         :' CLOWN
1740 DATA 5,50,7,7,2,41                         :' CHECK
1750 DATA 6,50,7,7,2,41,51                      :' CHECKER
1760 DATA 8,42,15,16,63,49,22,13,51             :' COMPUTER
1770 DATA 8,42,52,7,7,1,42,1,17                 :' CORRECT
1780 DATA 11,42,52,7,7,1,42,1,17,12,1,21        :' CORRECTED
1790 DATA 10,42,52,7,7,1,42,1,17,12,44          :' CORRECTING
1800 DATA 4,33,20,2,13                          :' DATE
1810 DATA 4,33,23,13,51                         :' DAUGHTER
1820 DATA 3,33,7,20                             :' DAY
1830 DATA 9,7,55,55,2,42,1,2,20,63              :' ESCAPE
1840 DATA 7,19,1,2,8,48,15,62                   :' EQUAL
1850 DATA 8,19,1,2,8,48,15,62,43                :' EQUALS
1860 DATA 3,7,47,58                             :' ERROR
1870 DATA 5,57,7,45,15,53                       :' HELLO
1880 DATA 2,32,51                               :' HOUR
1890 '  INFINITIVE, INVESTIGATE, INVESTIGATOR, INVESTIGATORS
1900 DATA 13,12,11,40,40,12,12,11,12,1,2,13,12,35
1910 DATA 16,12,12,11,35,7,7,55,1,2,13,12,0,36,20,1,13
1920 DATA 17,12,12,11,35,7,7,55,1,2,13,12,0,36,20,1,13,51
1930 DATA 18,12,12,11,35,7,7,55,1,2,13,12,0,36,20,1,13,51,43
1940 DATA 6,45,7,7,2,13,51                      :' LETTER
1950 DATA 6,45,12,12,2,13,62                    :' LITTLE
1960 DATA 6,16,7,7,16,52,19                     :' MEMORY
1970 DATA 6,16,12,11,12,2,13                    :' MINUTE
1980 DATA 4,16,15,11,29                         :' MOUTH
1990 DATA 3,56,15,53                            :' NO
2000 DATA 6,63,45,15,15,55,55                   :' PLUS
2010 DATA 6,14,7,7,0,33,19                      :' READY
2020 DATA 5,14,7,7,0,21                         :' RED
2030 DATA 7,14,53,1,63,24,2,13                  :' ROBOT
2040 DATA 8,14,53,1,63,24,2,13,55               :' ROBOTS
2050 DATA 5,55,55,2,8,58                        :' SCORE
2060 DATA 9,55,55,7,2,42,12,11,1,21             :' SECOND
2070 DATA 10,55,55,7,2,42,12,11,1,21,43         :' SECONDS
2080 DATA 8,55,55,12,12,55,2,13,51              :' SISTER
2090 DATA 7,55,55,2,13,59,2,13                  :' START
2100 DATA 7,55,55,2,17,24,2,63                  :' STOP
2110 DATA 5,13,23,23,1,41                       :' TALK
2120 DATA 7,13,23,23,2,42,12,44                 :' TALKING
2130 DATA 6,13,23,23,1,41,55                    :' TALKS
2140 DATA 4,13,24,6,16                          :' TIME
```

Listing 2 FILELOAD.BAS

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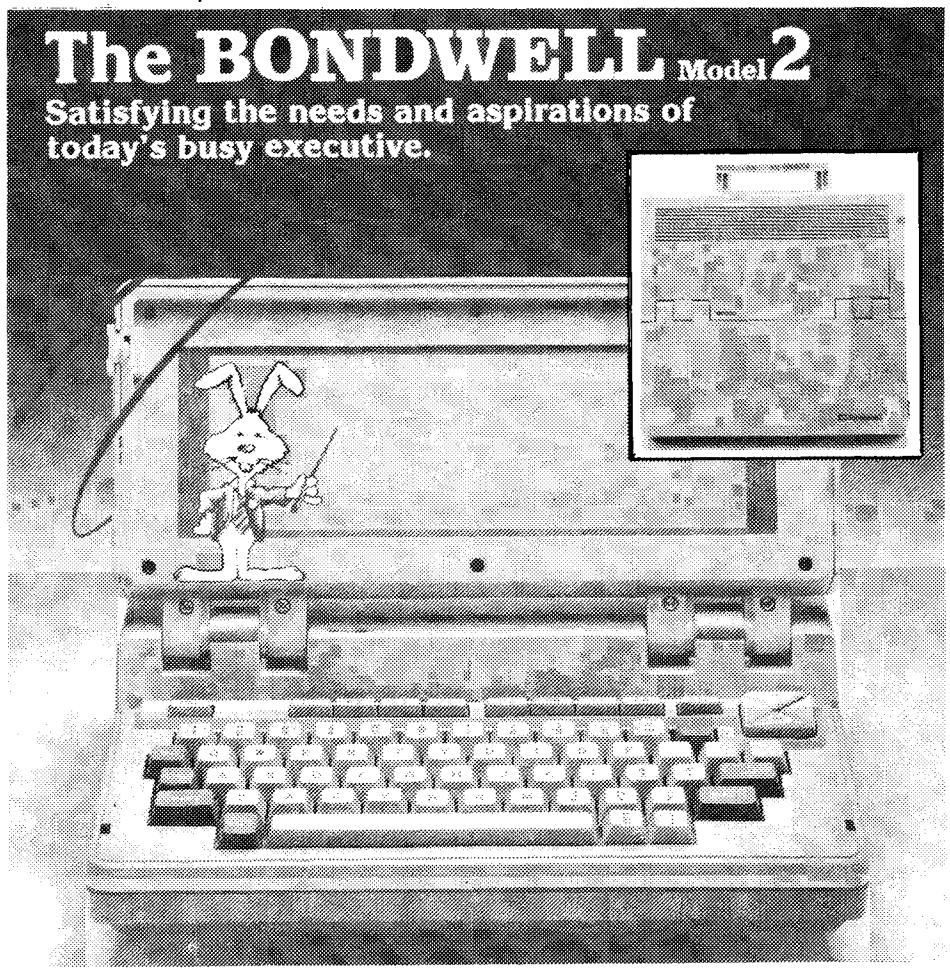

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HARDWARE

CPU
- Z80C CPU (low power)
- 4 MHz clock

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- 64K bytes user RAM
- 16K bytes video RAM
- 2K bytes monitor ROM
- 2K bytes character ROM

Display
- 224mm x 70mm LCD Display
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- 4 cursor control keys
- 8 programmable function keys with 16 user-defined functions
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GENERAL DESCRIPTION

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  11.2 in 3.1 in 12.2 in

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continued

```
2150 DATA 5,13,24,6,16,43                    :' TIMES
2160 DATA 2,25,60                            :' YEAR
2170 DATA 5,25,7,7,55,55                     :' YES
3000 '
3010 ' =====> CREATE RANDOM-ACCESS DISK FILE  ==============
3020 '
3030 OPEN "R", #1, "VOCABULA.RY", 40
3040 '
3050 ' =====>  Define 20 two-character fields in the file
3060 '
3070 FIELD#1,
     2 AS F1$,2 AS F2$,2 AS F3$,2 AS F4$,2 AS F5$,2 AS F6$,2 AS F7$,
     2 AS F8$,2 AS F9$,2 AS F10$,2 AS F11$,2 AS F12$,2 AS F13$,
     2 AS F14$,2 AS F15$,2 AS F16$,2 AS F17$,2 AS F18$,2 AS F19$,
     2 AS F20$
3080 '
3090 ' =====>  LOAD ARRAY  ================================
3100 '
3110 FOR WORD=1 TO TOP
3120   READ A(1)
3130   FOR J=2 TO A(1)+1
3140     READ A(J)
3150   NEXT J
3160 '
3170 ' =====> Load file as right-justified characters
3180 '
3190   RSET F1$=MKI$(A(1)) : RSET F2$=MKI$(A(2))
3200   RSET F3$=MKI$(A(3))
3210   RSET F4$=MKI$(A(4)) : RSET F5$=MKI$(A(5))
3220   RSET F6$=MKI$(A(6)) : RSET F7$=MKI$(A(7))
3230   RSET F8$=MKI$(A(8)) : RSET F9$=MKI$(A(9))
3240   RSET F10$=MKI$(A(10)) : RSET F11$=MKI$(A(11))
3250   RSET F12$=MKI$(A(12)) : RSET F13$=MKI$(A(13))
3260   RSET F14$=MKI$(A(14)) : RSET F15$=MKI$(A(15))
3270   RSET F16$=MKI$(A(16)) : RSET F17$=MKI$(A(17))
3280   RSET F18$=MKI$(A(18))
3290   RSET F19$=MKI$(A(19)) : RSET F20$=MKI$(A(20))
3300 '
3310 ' =====> Put the record in the buffer
3320 '
3330   PUT#1,WORD
3340 '
3350 ' =====> Display the word just written to prove it worked
3360 '
3370   PRINT WORD
3380 NEXT WORD
3390 '
3400 ' =====> Close file and exit
3410 '
3420 CLOSE
```

them to the speech processor without pauses.

The speech processor can access further ROMs which can be used to house words or complete sentences. The full eight-pin addressing would then be required. (This project uses just the 59 allophones and five pauses in the IC's ROM.)

Building the unit

I bought a small, ready-built unit from Tandy, not much larger than a radio speaker and taking an internal battery, which also solves the problem of coming up with a clever power supply for the different voltages needed by the speech processor and the amplifier.

The IC will work from about four-and-a-half volts up to seven volts. Above that, it will die rapidly. I use a four-cell holder to give me six volts and that works fine, as will any battery that supplies six volts. Do not be tempted to use a nine-volt battery, as the circuit is heavy on batteries — say, 100 milliamps when it is talking. However, batteries do not need isolating from noise sources, smoothing or anything else. My rechargeables and charger cost about the same as a power supply that could do the job.

One important thing to remember is to handle the IC carefully. It is a CMOS IC, and can be damaged by static and current leakage from soldering irons, as well as the usual threat of being stood on. The IC will be on a bit of conductive foam: leave it there until the moment you want to fit it. When you do come to handle it, touch some earthed metalwork, such as a radiator, to get rid of any charge you might have accumulated. I always have a radio on when I am doing this type of thing. If the radio goes 'click' when I touch the radiator, then I know that there is a lot of static about. But there is no great need to be paranoid. I have never destroyed a CMOS IC due to careless handling.

For full details of all the parts required, see Fig 2. Tandy and Dick Smith Electronics are worth checking for the components as is your local electronics shop. You may have some difficulty locating the SP0256AL2 integrated circuit. These are available from Daneva, 64-66 Bay Road, Sandringham Vic 3191, (03) 598 5622. The Centronics socket is available from Connect Electronics, 24 Punch Street, Artarmon NSW 2064, (02) 437 6224.

The printed circuit board designed for the project is available from *APC*. The board complete with all the components as a ready to build kit costs $55. If you prefer to buy the components yourself, *APC* will supply just the board for $10, which includes postage and packing.

Send a cheque or money order to *APC* Projects, 2nd Floor, 215 Clarence Street, Sydney NSW 2000. The circuit diagrams are shown in Diagrams 2a and 2b.

The 0.022 microfarad capacitors near pin 24 and the 33 kilohm resistors form a 5KHz low-pass filter. In other words, anything below 5KHz gets through. Pin 24 is the output from the IC, but it is a stream of zeros and ones. The filter rounds it all off and the result is an analogue signal of sorts. The one-microfarad capacitor to the right stops

```
10 ' ==========================================================
20 ' =====>  VOCABTST.BAS copyright (c) 1985 Paul Hardy       =
30 ' =====>  Reads the word number specified in from         =
40 ' =====>  file VOCABULA.RY and speaks it.                 =
50 ' =====>                                                  =
60 ' =====>  Program may be used for personal, non-commercial =
70 ' =====>  use only.                                       =
80 ' ==========================================================
90 '
100 OPTION BASE 1                    : ' Start arrays at 1 not 0
110 WIDTH 255                        : ' Allow long Basic lines
120 DEFINT A-Z                       : ' Integers for speed
130 DIM WORD(20)                     : ' Temporary word array
140 TOP=190
150 '
160 ' =====>  Open random access file, 40 chars per record ====
170 '
180 OPEN "R",#1,"VOCABULA.RY",40
190 '
200 ' =====>  Define the record: 20 2-character fields
210 '
220 FIELD #1,2 AS F1$,2 AS F2$,2 AS F3$,2 AS F4$,2 AS F5$,2 AS F6$,
            2 AS F7$,2 AS F8$,2 AS F9$,2 AS F10$,2 AS F11$,2 AS F12$,
            2 AS F13$,2 AS F14$,2 AS F15$,2 AS F16$,2 AS F17$,
            2 AS F18$,2 AS F19$,2 AS F20$
230 '
240 ' =====>  Request word number.  If out-of-range, ask again.
250 '                              If 999, then stop.
260 '
270 INPUT "Enter word number ";NUM
280 IF NUM=999 THEN CLOSE : STOP
290 IF NUM(1 OR NUM)TOP THEN PRINT CHR$(7) : GOTO 270
300 '
310 ' =====> Get requested record number  ====================
320 '
330 GET#1, NUM
340 '
350 ' =====>  Convert the character fields back to integer
360 '
370 WORD(1)=CVI(F1$) : WORD(2)=CVI(F2$)
380 WORD(3)=CVI(F3$) : WORD(4)=CVI(F4$)
390 WORD(5)=CVI(F5$) : WORD(6)=CVI(F6$)
400 WORD(7)=CVI(F7$) : WORD(8)=CVI(F8$)
410 WORD(9)=CVI(F9$) : WORD(10)=CVI(F10$)
420 WORD(11)=CVI(F11$) : WORD(12)=CVI(F12$)
430 WORD(13)=CVI(F13$) : WORD(14)=CVI(F14$)
440 WORD(15)=CVI(F15$) : WORD(16)=CVI(F16$)
450 WORD(17)=CVI(F17$) : WORD(18)=CVI(F18$)
460 WORD(19)=CVI(F19$) : WORD(20)=CVI(F20$)
470 '
480 ' =====>  Say the word.  First element says how many
490 ' =====>  allophones follow.
500 '
510 FOR I=2 TO WORD(1)+1
520 LPRINT CHR$(WORD(I));
530 NEXT I
540 LPRINT CHR$(4);                  : ' Send a pause at the end
550 GOTO 270                         : ' Request next word
```

Listing 3 VOCABTST.BAS

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y standing DC from the IC getting rough to the amplifier. After that, any nplifier will do the job of generating an udible signal.

Check everything thoroughly before ugging the IC into its socket. The chan-es are that the IC's legs will be splayed o far apart to fit into the socket. Touch n earth (like a radiator — *not* a mains ocket earth) to discharge any static, and end the chip's legs into position.

Resistors have been connected to the ix data lines to ensure that they are held t logic 0, even when the printer lead is isconnected. Without these, the circuit as the disconcerting habit of producing andom allophones whenever the com-uter lead is disconnected. The two nused data lines have been permanen-ly connected to the negative supply.

A Centronics socket is fitted to the PCB o enable the speech unit to be connec-ed to almost any computer. The sim-plest way to connect a micro is to buy a Centronics printer cable and plug it in. A link-wire arrangement has been provided to overcome the differences between micros when addressing a Cen-tronics port. The link wire straddles the SBY and LRQ outputs (pins 8 and 9 of the IC, and pins 10 and 11 of the Cen-tronics connector).

Wiring up your own Centronics con-nector takes a bit of thought. Datasheets on the IC number the data lines from A1 to A8. The data sheet for my printer (which I used to work out the socket wiring) refers to them as lines 0 to 7. Be careful not to get confused — whatever the numbering, there are eight lines. Do not wire it up one line out and have one left over at the end.

On your micro, the connection may be different, but the speech processor does not need a comprehensive set of connec-tions. Of course, a socket is not necessary, and some ribbon connector could be wired straight onto the board.

Software

I wrote three programs (see Listings 1 to 3) to test the finished board and to pro-vide the basis for a speech system. The programs are written in Microsoft Basic and are very simply structured, so their functions are obvious and conversion to other dialects is easy.

Listing 1 (HELLO.BAS) is the test pro-gram. The statements at the beginning assign the allophones to the numbers that generate them. Note that allophone /OR/ is given as DOR, because OR is a reserved word. Note also that many Basics only allow two-character variable names, whereas this program uses three-variable names to stay as close as possible to the actual allophone names.

Output to the speech processor is via LPRINT. Note the use of semicolons to suppress carriage returns. Variable PP (allophone /PP/) is set to the value 9. On my Osborne, I get nine spaces output instead of a tab character, so I can't use this phoneme. In the other listings, I have cured this by cheating.

To set up the links, type in and run this program. Without any links connected the computer will 'hang-up', awaiting an Acknowledge and/or Busy signal. Try

'It should be possible to construct sentences and output them to the speech processor without pause.'

linking terminal d to a or b and the terminal c to a or b. When the correct combination is achieved, the string of allophones will be sounded with correct timing. Note that the last allophone will continue sounding at the end of the test. Probably only one link will be required, but two links can be inserted if necessary. Note that terminals c and d must not be linked to each other, or the IC may be damaged.

If it still doesn't work, disconnect the battery and check the following:
— that the software is correct:
— that the IC is in the right way round;
— that any pins that should be tied to ground actually are, and not to the positive supply rail (and *vice versa*);
— that none of the legs are bent under;
— that if any of the capacitors display '+' or '—' signs, check they are in the right way; and
— check that you have correctly identified pin one on the cable connector you are using, and that you have not wired the connector up as a mirror image.

If the speech unit continually repeats AR, there is a semicolon missing from one of the LPRINT statements.

Listing 2 (FILELOAD.BAS) is the most important listing. It is well commented. The allophones for each word are stored in data statements. The standard I have chosen is that the first integer indicates the number of allophones that follow: for example, the word 'zero' consists of allophones /ZZ/, /YR/ and /OW/. These are represented by the three numbers 43, 60 and 53; hence the DATA statement: DATA 3, 43, 60, 53.

Line 110 allows statement lines of

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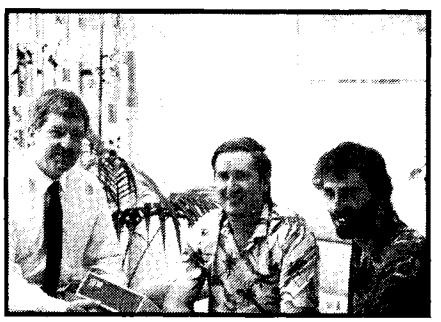
That was my shopping list when I went looking for a modem for my IBM. I needed a standalone modem that I could leave connected to the phone logging data while the IBM was disconnected, and that could be connected to a variety of other computers. And I didn't want to pay over $1000.

A fully-featured IBM modem for under $400.



It seemed an impossible task.The available modems were all over $1000 or too dumb. So I rang Chris & Dan who had designed and built the Micro-Ed Apple modem and put the proposition to them. Now, these guys are very bright software engineers and they just said, "No, it can't be done." But to humour me they sat down at the CAD/CAM and clicked out a rudimentary design on smArtWorks. Which is when a few "maybe"s started drifting into their conversation and after a few rewrites they put together a working prototype.

And it worked! The features were right, the software was right, the costings were right. Not only could it be done, IT HAD BEEN DONE!

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* Mains powered & onboard speaker
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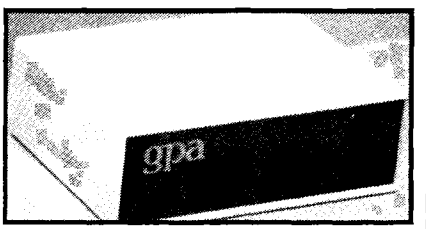

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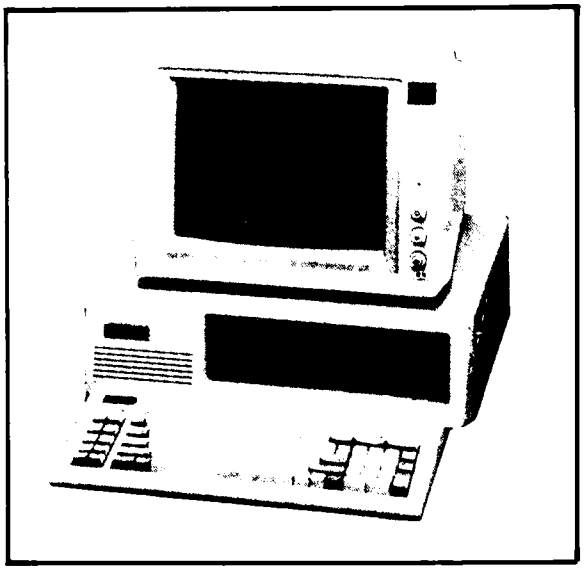

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255 characters, rather than the 72 which Microsoft Basic defaults to.

Microsoft Basic under CP/M 2.2 supports random file access. A random file is one where data can be retrieved from anywhere within the file if you know the exact location of the data. In practical terms, this means that the file does not have to be loaded into an array at the start of the program, saving space. To create a random file, you must specify the file name, the file number, the length of each record, and the construction of the fields in that record. I have assumed that no word will need more than 19 allophones to generate it, and I have used the first field to store the number of allophones, just like the data statements. Each field is two characters as I don't need to store anything higher than 63. Twenty fields of two characters means that each record is 40 characters long; this is done in lines 3030 and 3070. Note that each field must have an associated field name which must be a string variable: I chose F1$ to F20$. Microsoft Basic stipulates that the names can only be used in the FIELD statement, and line where they are loaded. They cannot be used or modified elsewhere in the program because the assignment statements in lines 3190 to 3290 are not assigning values to F1$-F20$, but using them as pointers to the locations of the variables A(1)-A(20) in the record.

Lines 3190 to 3290 need closer examination. The function MK1$ is a Microsoft-supplied function to convert an integer to internal record format. Real and double-precision variables have their own conversion functions MKS$ and MKD$. RSET means the field will be right-justified. Therefore, RSET F1$=MKI$ (A(1)) means convert the integer in array element A(1) from integer format to internal record format, and store it right-justified. F1$ points to its location in the record.

Line 3330 PUTs the record into the file buffer. Line 3370 just prints the number of the word on screen so that you know the program is running.

When the program ends, there will be a random access disk file called 'VOCABULA.RY' containing all the words listed in the data statements. Fig 3 lists the words in alphabetical order with the numbers needed to call them from VOCABTST.BAS (Listing 3). The allophones in Fig 1 are also available.

Listing 3 (VOCABTST.BAS) complements Listing 2. When run, it prompts for a word number. Enter a number, and the word corresponding to that number will be spoken. This is really the heart of the software side of the project. The other routines provide various 'support' functions.

It uses the random access file VOCABULA.RY created by FILELOAD.BAS. The program has to know the exact structure of the file. This is done in lines 180 and 220, which have exact equivalents in Listing 2.

Line 270 prompts for the word number. That record number is then 'got' by the GET statement in line 330. (GET is the functional opposite of PUT.) At this point, the record number is available to the program.

Lines 370 to 460 convert the data held in the record back from internal format to integer. CVI is the Microsoft function to convert from a two-character string to integer. There are similar functions for single and double-precision variables: CVS and CVD, operating on four-character and eight-character strings respectively. WORD(1) =CVI (F1$) means get the field pointed to by pointer F1$, convert it to integer, and assign it to element one of array WORD.

Lines 510 to 530 loop through array WORD from the second element to the one specified by the 'length' indicator in element one. Each integer is output to the printer port (the speech unit) and the carriage return is suppressed with the semicolon. Line 540 sends a short pause to end the word.

Going further

The program listings are meant as guides; they illustrate a few of the possibilities of driving the speech unit. Perhaps their most useful aspect is the fact that the hard part, working out the allophones, has been done in the data statements. If you use the data statements but not the programs, remember to omit the first number in each line if your program does not need to know how many allophones are in each word.

My use of random access files is also not strictly necessary. An alternative would be to have a single program to load all the data into an array, and just access the rows of that array. Or, instead of having a random access file, write everything to a 'normal' sequential file (the only type supported by a lot of Basics) in one routine, and load the file into an array in a second routine. However, you may run into space problems as more words are added to the vocabulary.

In VOCABTST.BAS (Listing 3), the random file reading code in lines 330 to 530 would make a suitable subroutine within a more sophisticated program which could generate entire sentences,

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either through the keyboard or by accessing a file of word numbers. A way of cutting down the vocabulary file would be to keep common word endings separate and concatenate them on the word roots. The plural 's', and so on, would be prime candidates. My routines always end by sending a pause to stop the speech board talking; this would have to be removed for the concatenation technique.

One final note: there is an allophone for the sound /PP/, or the letter 'P' in a word. This is a decimal 9. If the programs were talking to a printer, this would be a 'tab'. My Osborne sees the 'tab' and sends out nine spaces which are really decimal 32s, so instead of saying 'P', the board gets a severe case of the stutters and goes 'a-a-a-a-a-a-a-a-' instead. I use the phoneme for 'B' instead. You could get round this in the programs by using the Basic OUT command instead of LPRINT, but this is not possible on the Osborne as the OUT command can only be used for bank-switching to access the video RAM, and so on.

While doing this, I was worried that the random file access might be too slow to keep the speech unit talking smoothly. In fact, I have not come across this problem. If you do, and you have a CP/M (and presumably just about any other) system, one solution might be to always construct the dictionary file on a blank disk so that the disk sectors are contiguous and read/write head movement is limited.

Another solution is to make good use of the way MBasic does not use all the RAM available to it by creating a smaller CP/M system using MOVCPM, and writing the code for a small RAM disk to reside above CP/M.

END

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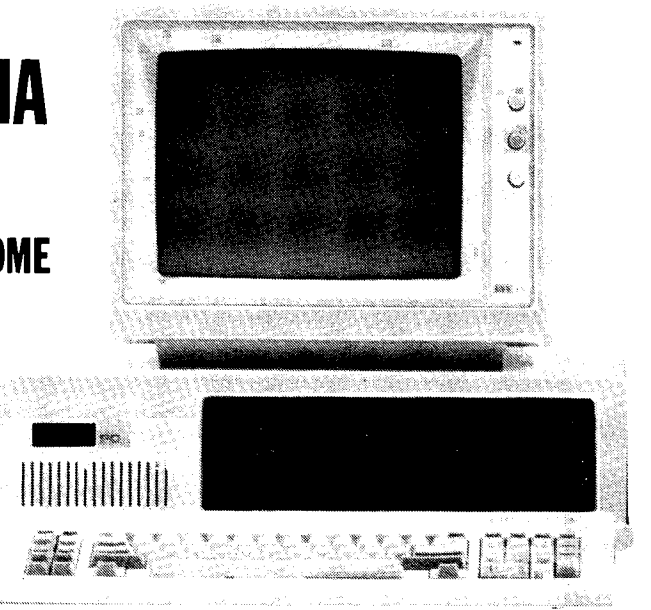

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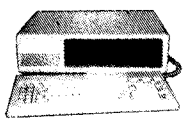

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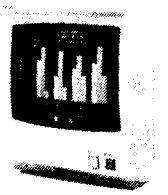

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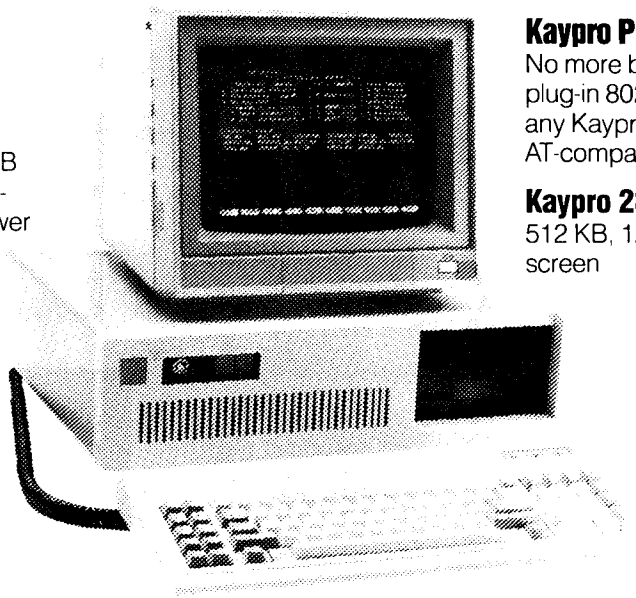

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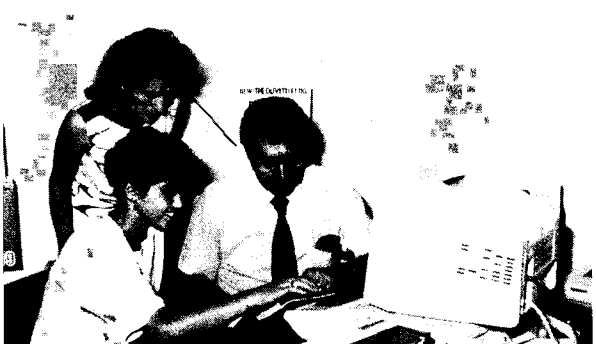

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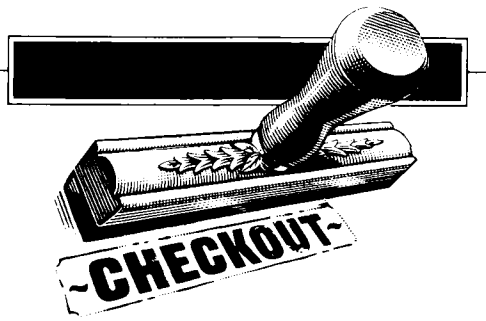
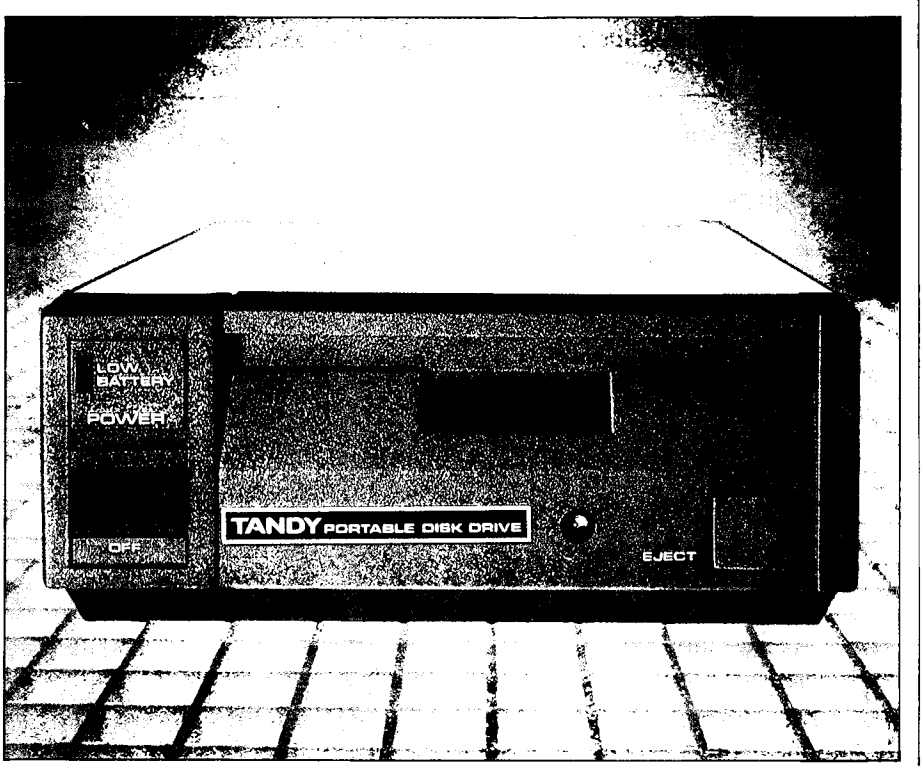


Tandy Portable Disk Drive

For the executive on the move, the combination of a Tandy Model 200 with a Portable Disk Drive would seem to offer all the benefits of the office. Menno Aartsen used it in some rather severe weather conditions to test out its reliability.

Tandy Corporation's latest peripheral add-on to its range of portable micros, the Portable Disk Drive, is by no means the only portable disk on the market. Epson introduced one for the PX-8 in 1984, followed by Brother, and others have tried to capture some of this market.

The main reason why the Tandy version warrants extra attention is that the lap-held TRS-80 Model 100 is still the most popular and widely sold 'intelligent pocket-book' on the market, with the range now extended by the Model 200, an upgraded 100 with more RAM memory and a larger screen. None of the other manufacturers have really 'made it', and most have disappeared as fast as they came. While Data General's One is still available, Apricot has taken its portable off the market, and Epson is the only company still manufacturing a reasonably successful true lap-held.



As it turns out, the market really only wants true portables or desk-top micros, and there isn't much inbetween.

The Portable Disk Drive is a small, two-pound unit manufactured by Brother in Japan. It uses 3.5in microfloppies which yield just over 100k of storage. Powered by four AA batteries or an optional DC power unit, it connects to the Tandy Model 100 or 200 via RS232, with data exchange effected at 19200 bits per second. With an average access time of 0.82 seconds, a typical 5k file is read in a couple of seconds and written away in double that time. A maximum of 40 files can be stored on the single-sided, hard-sectored microfloppy.

System software

The DOS is loaded into the portables using a simple, three-line Basic program and takes up around 7k of machine language memory. It isn't in any way

similar in operation to the disk drive(s) in the Video/Disk interface — the Portable Disk Drive cannot be addressed directly from Basic but uses a separate menu which, when booted, replaces the standard menu that the portables normally present. Where Tandy's Disk Basic allows DOS calls direct from Basic, the new DOS has all the necessary utilities built into the command file, where they are accessible as menu items but not otherwise.

Although the DOS suffers from the same problems as Disk Basic (the machine code resides in the same RAM area used by other software), Tandy has provided a partial solution to machine code programs wiping each other: the operating system now resides both in low and high memory, and can be cleared from the highmem for the operation of other software (such as the portable Scripsit word processor), then reinstated with a system call. Files cannot be accessed directly, but have to be read into RAM, which can be a slow and laborious process.

It is obvious that the lack of a sophisticated operating system hampers the use of most add-ons to the Tandy portables, but then my experience with more elaborate lap-helds (Epson's PX-8 comes readily to mind) shows that a true operating system — CP/M in this case — without sufficient storage memory, gives rise to one crash after the other, and that is something that the Tandy/Olivetti/NEC trio definitely cannot be accused of. They're just about crashproof — even a defective disk on the new portable drive does not mean a 'wipe-out' since it isn't directly wired into any processor.

In use

So far, so good — the combination of a 100 or 200 with a portable disk drive yields an easy-to-use, crashproof and reliable tool for the executive on the move. Especially the 200, with its built-in Multiplan spreadsheet and triple memory, allowing a maximum of 72k, becomes a reasonably powerful move-machine. Tandy obviously still doesn't believe in desk-top emulators such as the PX-8, intended to give you *everything-you-have-at-the-office*, but creates its systems as complementary to the office or home micro. Affordable, too — in the US, the 16k Model 100 with built-in Bell modem and floppy drive will set you back less than $US700, without the requirement to buy any add-ons at all. And the 200, with its built-in modem, becomes a really powerful intelligent terminal when hooked up to Dialcom and the floppy drive.

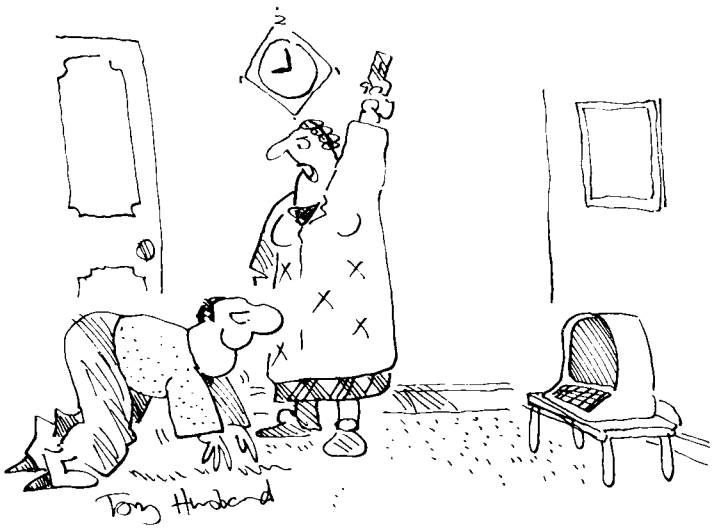
The principle is simple: access and active files in RAM, workfiles on disk and main storage in another computer. The general idea is that the portable logs into Tandy's 1000, which can be left to auto-answer, so providing access to one's files.

This way of working provides an intelligent terminal with limited memory and storage as a window on a mini-computer with messaging facilities. Most systems offer hard copy and telex messaging as well as (in the US, at least) travel booking, stock market shopping and many other useful features. Every add-on carries weight, of course, and the traveller will find that a lap-held with acoustic coupler and floppy disk drive will only just fit in the average executive suitcase. This ought to improve when Tandy gets Telecom approval for its CCITT internal modem. At the moment Tandy is supplying its Model 100 and 200 with the same modem as is supplied with those machines in the US, but which will not work with the telephone system in Australia. The reason for this is two-fold: firstly, the CCITT modem supplied in machines sold in Europe has not yet been approved by Telecom in Australia; and secondly, it is cheaper for Tandy to leave a modem (be it Bell or CCITT) in the machines supplied to the Australian market than to pay for it to be removed, and by supplying a Bell modem which will not work in Australia, Tandy is not seen to be 'thumbing-its-nose' at Telecom.

A problem that now arises for Australian users of the Model 100 and 200 is that an external modem will have to be used for communications and since both external modem and floppy drive use the same RS232 port, you can't use the drive while 'telecommuting' — a definite drawback. I don't quite understand why Tandy chose not to go with a different brand of portable drive, using the expansion port underneath the portables, since it was testing it at Fort Worth last year. I assume, however, that pricing may have had something to do with that decision.

Although rumour has it that Tandy has yet another portable on the way, with the 200 really an interim machine, the features now available for the 100/200 seem to suggest that these portables are going to be with us for some time. The 40-column display is readable even in dim lighting, while the floppy allows quick booting and reading of work files with great ease. With Multiplan available for both machines on ROM, and external storage, Tandy appears to have filled the gap left by IBM, with cheap portables with full ASCII compatibility that will talk to any desk-top without conversion problems.

Tandy's scenario has it this way: you take your 100 or 200 away with you, and leave your 1000 in the office in auto-answer mode. This configuration enables you to work on-the-road or at home, since all 1000 Deskmate files are in ASCII format, and you can put your finished articles back into the 1000 for safekeeping until you (or your partner or



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secretary) get there. At the same time, the portables allow you to keep in touch with the world, get the news and generally go about your business for as long as there is a packet-switched network nearby.

Endurance

One thing in particular impressed me in the performance of this piece of Tandy gear, and that is its ability to endure travel and climatic changes. Tandy's US marketing director Ed Juge had mentioned to me that all the company's equipment is tested to withstand travel under extreme circumstances — from −10°C to +45°C. Looking out the window of his office in Fort Worth, Texas, I understood why — the heat vibration of an average April afternoon in Texas — 43°C — was clearly visible. This, compared with the freezing temperatures of a Canadian winter, is actually quite severe on microprocessor equipment; after all one does carry portable equipment around in extremes of weather.

I have experienced this more directly than most since I travelled to Miami, Florida from Europe recently and, since then, manufacturers hate my testing their equipment. A typical situation is that an American supplier allows me to review a piece of equipment and sends it via a courier service which parks it on my doorstep in mid-afternoon, where it sits in the Florida sun for a while. As the temperature is then around the 32°C mark, and the humidity equally high, you can probably imagine what happens when I take the carton inside, where it is a steady air-conditioned 24°C. Apart from anything else, this process has a habit of destroying floppy disks.

Florida has another peculiarity — thunderstorms with severe lightning. It gets so bad that the magnetic fields and the power brownouts blow chips, destroy (again) disks and generally play havoc with computers. I've had to retire my IBM PCJunior as it very simply couldn't cope, and if lightning strikes a power line nearby, when you're reading or writing to disk, well — goodbye software. Except of course, in the case of my trusted 100, which keeps on chugging when everything else goes — on a full set of batteries, I even managed to produce a report while all power in South Florida was out for six hours after a brushfire destroyed a switching station.

Conclusion

By now you'll be saying: 'That's all very nice, but who cares anyway?' But this is exactly what the portable computer has to endure, because it *does* travel with its user. This can mean boarding a plane in sub-zero temperatures in London, a few changes in climate on the way, and (in Australia) continuous change from air conditioning into the environment.

It's a point seldom made, but having had bad experiences with desk-top and portable alike (the tape drive on my PX-8 still has a sniffle), I can only say that both the Kyocera lap-helds (Tandy, Olivetti and NEC) and the new portable floppy sail through this type of punishment, which causes more hard and software failures than people generally appreciate.

Tandy doesn't guarantee it, of course, but the new drive will still work with a floppy with condensation on it.

The Portable Disk Drive costs $349.95. The 24k Tandy Model 100 costs $899 and the 24k Model 200 $1399.

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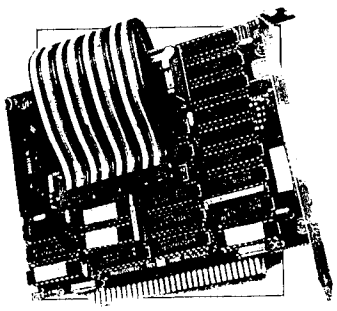

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SCREENTEST

The Art Studio

Stephen Applebaum looks at a Mac-style paint program for the Spectrum, which is a notch above most design packages for home micros.

Until the launch of Apple's Macintosh, windows, icons, mice and pull-down menus (known collectively as 'WIMPs') were luxuries available only to those at the more affluent end of the computer market. However, the subsequent popularisation of this user-friendly environment has seen the computing industry inundated with WIMP-orientated systems for micros as diverse as the IBM PC and Sinclair's Spectrum.

Rainbird, a company in the UK, has recently taken on board an excellent WIMP-based graphics package called The Art Studio, from Oxford Computer Publishing. The company's claim that it turns the Spectrum into a Mac is a mote exaggerated, but not totally spurious. There is a distinct, if self-conscious, atavism in its make-up, suggesting that its programmers felt obligated to emulate Apple's MacPaint. Whether or not this is true, The Art Studio at $49.95 is as close to the Macintosh as you're likely to get on the Spectrum, and a notch above most design packages.

Unfortunately, The Art Studio incorporates my *bête noire*, Lenslok. For those of you who haven't yet faced this challenge to your patience, Lenslok is a new form of anti-piracy device. Instead of colour charts and coded passwords this ingenious device unscrambles scrambled numbers; it works by properly aligning a specially-designed lens over a specific area onscreen, enabling you to read a number and so enter the program proper. However, be warned: it often takes several attempts to get it right.

The reward for successfully negotiating Lenslok is a white screen with a blue menu bar running along the top, and an arrow (cursor) in the centre. There are three methods of manipulating the cursor: the four arrow keys on the Spectrum keyboard; the joystick; or the Advanced Memory Systems' AMX mouse.

My personal favourite is the mouse because, unlike the other two, it allows curves to be drawn accurately, with a simple sweep of the hand. Ironically, curves drawn with either the arrow keys or a joystick tend to be rough and graduated.

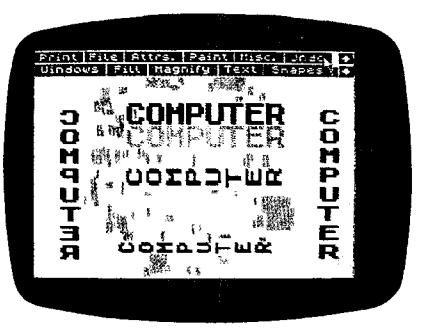
Design

The Art Studio's most delightful feature is its use of pull-down menus, a relatively new phenomenon on the Spectrum. For those of you unfamiliar with pull-down menus, a pull-down menu is a list of functions contained under a single heading. For instance, the menu bar running along the top of The Art Studio's display contains only 11 options. Select one of these with the cursor, however, and a whole window full of options appears on the screen. Not only does this mean all selections can be made onscreen, but also the speed of the operation is greatly increased.

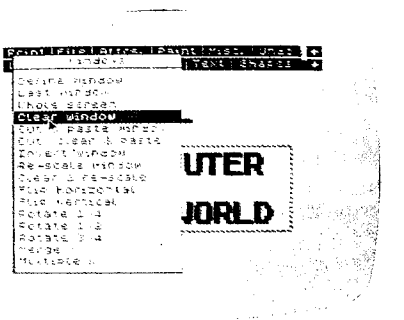
Speed and flexibility are two major virtues of WIMPs. And for those who suffer from keyboard phobia, the aforementioned ability to select options without having to revert back to the keyboard is a boon. This operational simplicity runs throughout the whole of The Art Studio. I'll illustrate the point by examining the contents of each of the pull-down menus in turn, starting with Paint.

Menus

Most people, when they pick up a design package, want to jump straight into



Windows contain information . . .



. . . and are flexible

drawing pictures. Their first port of call, therefore, is the Paint menu, as it contains the basic tools for drawing. Included in the menu are: a pen, spray can and brush, as well as a brush editor and a command called inverse.

Selecting the pen option takes you into another sub-menu containing a chart of 16 different pen types. Some are for fine line work, while others are more suitable for shading or special effects. When inverse is set to 'on', the pen turns into an eraser, with as big a selection of sizes as in the normal mode of operation.

The spray can is similar to the pen, except that its eight selections are of different densities rather than shape. In use, the spray can is just like its real-life namesake, even to the extent of the density of paint on the paper which increases if you hold it in one place. You can use this facility, in conjunction with a mouse, to perfect your style before trying a few home murals!

Thirdly, the brush. Again there are 16 styles to choose from, although, by selecting the brush editor, it's possible to change one, or all of them, to suit your own requirements.

To make the artist's life easier, The Art Studio has a Magnify menu containing functions to enlarge a section of the screen to two, four or even eight times its normal size. This is a boon for those who like doing detailed work, as it allows changes to be made at pixel level.

Whereas form and structure are the main concerns of the sketch artist, accuracy and clarity are the major preoccupations of the technical designer. To accommodate such needs, The Art Studio has a Shapes menu containing utilities which allow different geometric forms to be drawn simply and quickly.

Circles, rectangles, triangles and rays can all be drawn without recourse to the Spectrum keyboard. Circles are especially easy to set up, using a technique akin to that found in more expensive systems; firstly, the centre is defined by clicking the mouse (key, or joystick), and then the circumference is set by choosing a point away from it.

Elastic, also in the Shapes menu, allows for figures to be expanded and contracted until they are the desired size. This is particularly useful for experimenting with the sizes of circles. For shapes with straight sides, there are two snap functions which ensure perfectly horizontal and vertical lines.

When programmers set out to make a graphics package look like MacPaint, they go to great pains to emulate its fill patterns. It's not surprising, therefore, that the fill patterns in The Art Studio are almost identical to MacPaint's. To encompass MacPaint's so-called textures, without compromising other forms of shading, The Art Studio has three kinds of fill and a texture editor.

All The Art Studio's fill functions are found, logically enough, in a Fill menu. Selecting solid fill, the first on the menu, turns the arrow cursor into a paint roller. Placing this within a solid figure, and then pressing on the mouse, fills the shape with the current ink colour, very rapidly.

If solid fill is all very familiar, wait until you move onto the patterned stuff. Hidden under the textured fill option are 32 different Mac-like textures (64 when you consider their inverse), each of which can be applied to an area onscreen. The application of texture takes place in two stages: firstly, an area is flooded with the current ink colour, then the new texture is mapped onto all the pixels affected.

Tedious as it may sound, a textured fill is extremely fast, as is the undo facility that allows the last command executed to be reversed. So, if you've shaded an area and are unhappy with the result, undo takes it back to its original state, instantly.

Wash texture is also in the Fill menu, but isn't a 'fill' in the strictest sense of the word. Instead of colouring, or shading 'empty' areas, wash texture lets you apply a pattern onto pixels which have already had their ink colour changed. There are numerous applications for the wash texture option, one of the most effective being the shading of text; that is, you can emphasise a piece of text by washing it with one of the many textures available.

Black and white shading can produce some nice penumbral effects, if properly used. On the other hand, for more flamboyant designs, colour is available from an Attributes menu. This is where all the usual Sinclair colour commands can be found, having had their access points seemingly shifted from the keyboard to the screen.

Like most graphics packages for the Spectrum, The Art Studio is hampered by the machine's poor colour-handling capabilities. Apart from looking generally jaded, colours often clash, producing ugly, unwanted squares on the screen. The cause of this is the computer's inability to cope with more than two colours (background and foreground) per character block. Suitable palliatives are:
confining your picture to two hues; or using a large expanse of the same colour, making it impossible for two ink or two paper colours to come into contact.

When I first used MacPaint, I was amazed at the way pieces of a picture could be demarcated (windowed), then relocated to another part of the screen. To a great extent this feat was made possible by the software, which in turn was making use of the Macintosh's bit-mapped display. I was in for an even bigger surprise, therefore, when I saw The Art Studio performing the same task. The ability to perform such tasks is one of The Art Studio's more powerful features, but it is just a fragment of what is to be found in the Windows menu.

With 16 separate selections, the Windows menu ranks as the largest in The Art Studio. Top of the list is an option to define a window. Windows can be set up as empty boxes or used to surround existing information. Whatever the case, they are formed by defining the top left-hand corner, then moving the cursor until the frame reaches the required size. Once complete, there is a variety of operations which can be performed on the window's contents.

'Cut and paste window' and 'cut, clear and paste window' are similar functions with subtle differences. The first copies the contents of a window then relocates it, leaving the original template intact; the latter erases it. Several copies of a window can be made by selecting 'multiple' from the same menu.

Windows are flexible to the point of changing size. All windows, no matter how large or small, may be re-scaled; they can be enlarged, reduced, squashed or stretched. Re-scaling takes place in two stages, rather like the textured fill. First of all, a window is re-scaled in the vertical direction to an internal buffer, and then in the horizontal direction to the screen. This is followed by the first stage being performed to the screen. When a window is reduced, fine detail is lost, and the clash of attributes mentioned above is accentuated. Therefore, the best results are obtained when a reduction is made on a window containing only two colours. Finally, windows can also be mirrored, flipped or rotated.

Documentation

A complex piece of software like The Art Studio requires a comprehensive manual to guide the user through its many menus. Rainbird hasn't stinted in this department, producing a manual as professional as the program it accompanies. The 58-page booklet is well written and annotated from beginning to end, culminating in a simple, though no less informative, example of how to construct a picture from scratch.

Also explained in the manual is a program to allow purchasers to make a personally-customised version of The

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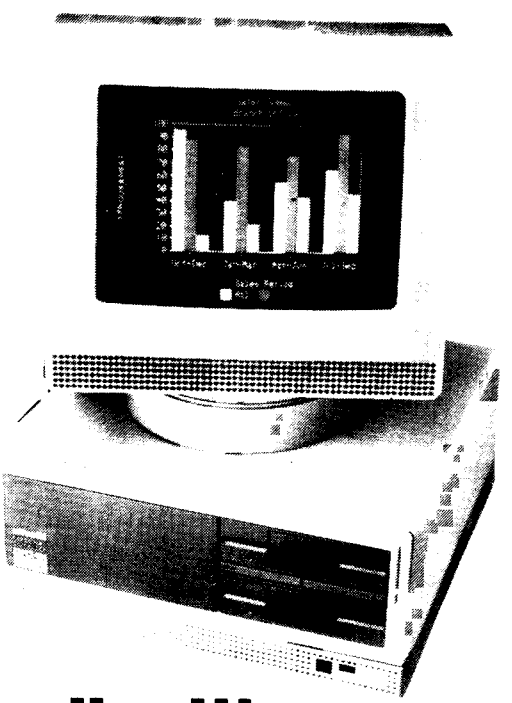

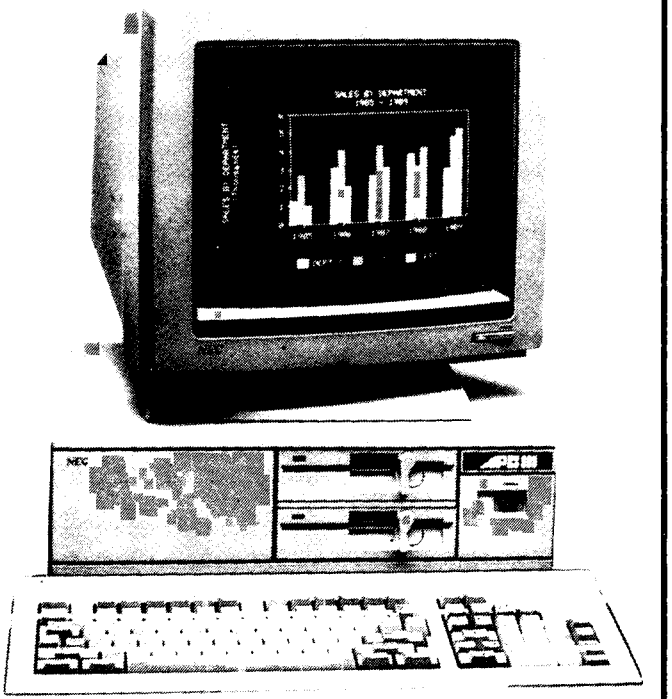

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Art Studio, by transferring the program onto a separate blank tape. The copy is personalised in the sense that it contains parameters relating to specific printer interfaces and printers. Seventeen Centronics and RS232 interfaces are supported by The Art Studio, so it's unlikely that anyone will be unable to produce hard copy, unless they lack a printer, of course.

Prices

The Art Studio at $49.95 is primarily a cassette-based program, but also available is an extended version, costing $75, for users of Sinclair's Microdrive. There are no changes, just the addition of a screen compressor program, an arc in the Shapes menu, several new file-handling commands and two installation programs for the Microdrive. Computer owners who buy The Art Studio will not be able to make use of the screen compressor due to its large memory requirement.

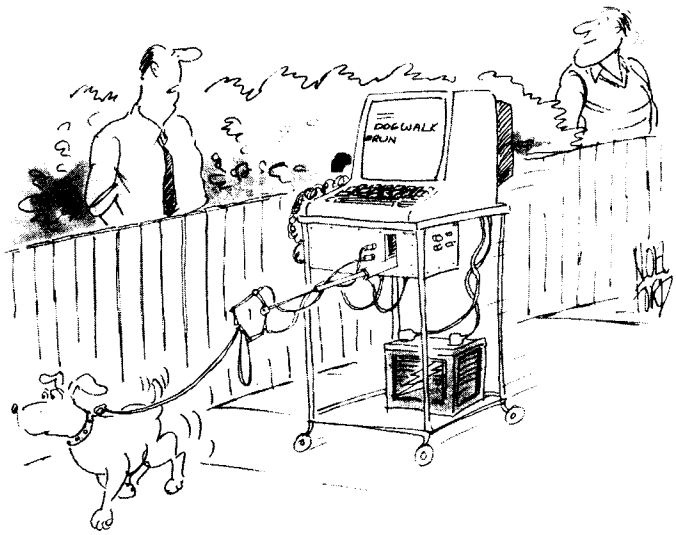
Conclusion

The Art Studio is one of the most complex and powerful design packages currently available for the Spectrum.

I would suggest that its major, and certainly most profitable, use is as a means of designing title screens for commercial games. You can't reproduce the disturbing imagery of Dali, or the burning passion of Van Gogh with it, but you can produce professional front ends for your programs, as long as you have the necessary artistic bent.

END

Art Studio is available from Gametronics, Shop 6, 177 Toorak Road, South Yarra 3141. Telephone: (03) 241 3031.



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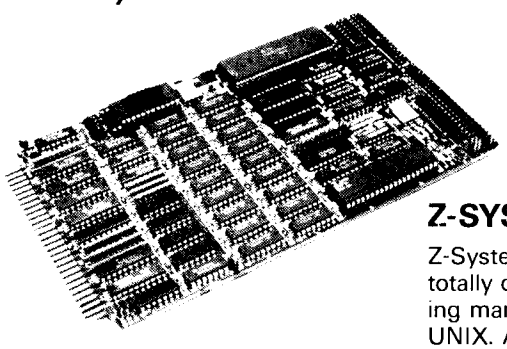

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Technical Data - HR31 200

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Vert. Scan Frequency:	60Hz
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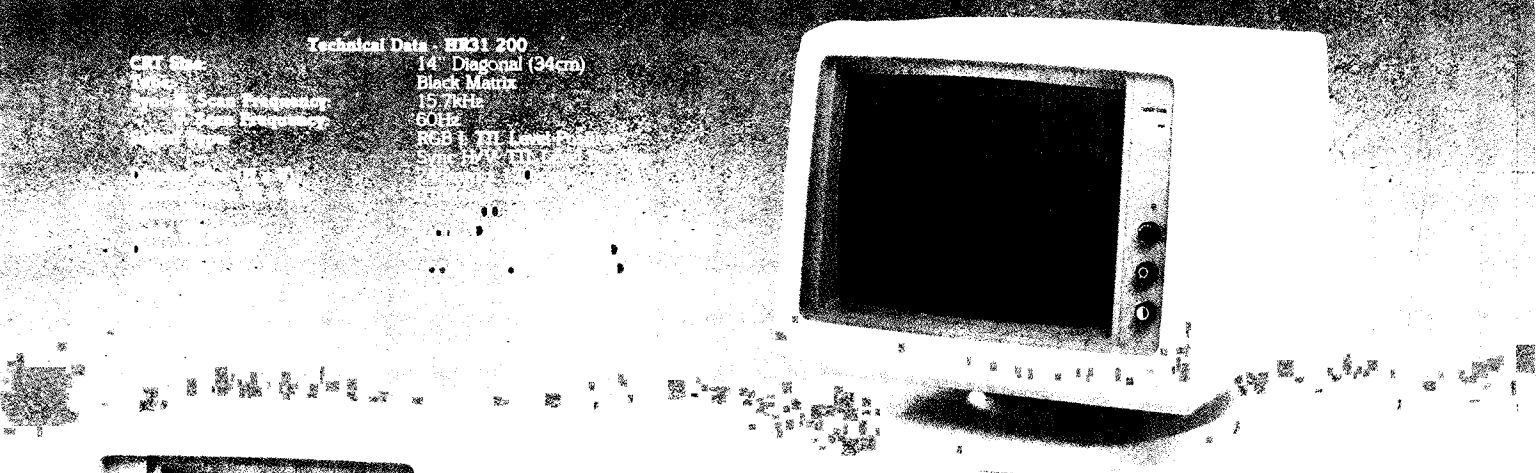
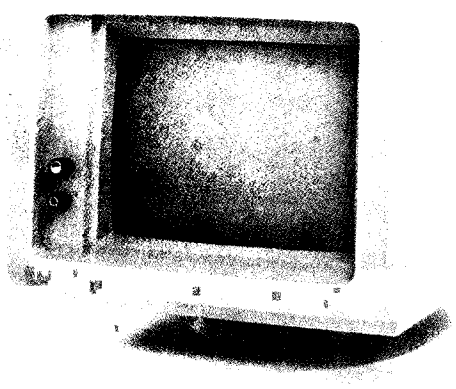
Sync:	H/V TTL Level Negative





Models HR 39 & HR 134

Technical Data - HR 39 & HR 134

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Phosphor:	HR 39 (Green); HR 134 (Amber)
Sync-H. Scan Frequency:	18.432kHz
V. Scan Frequency:	50/60Hz
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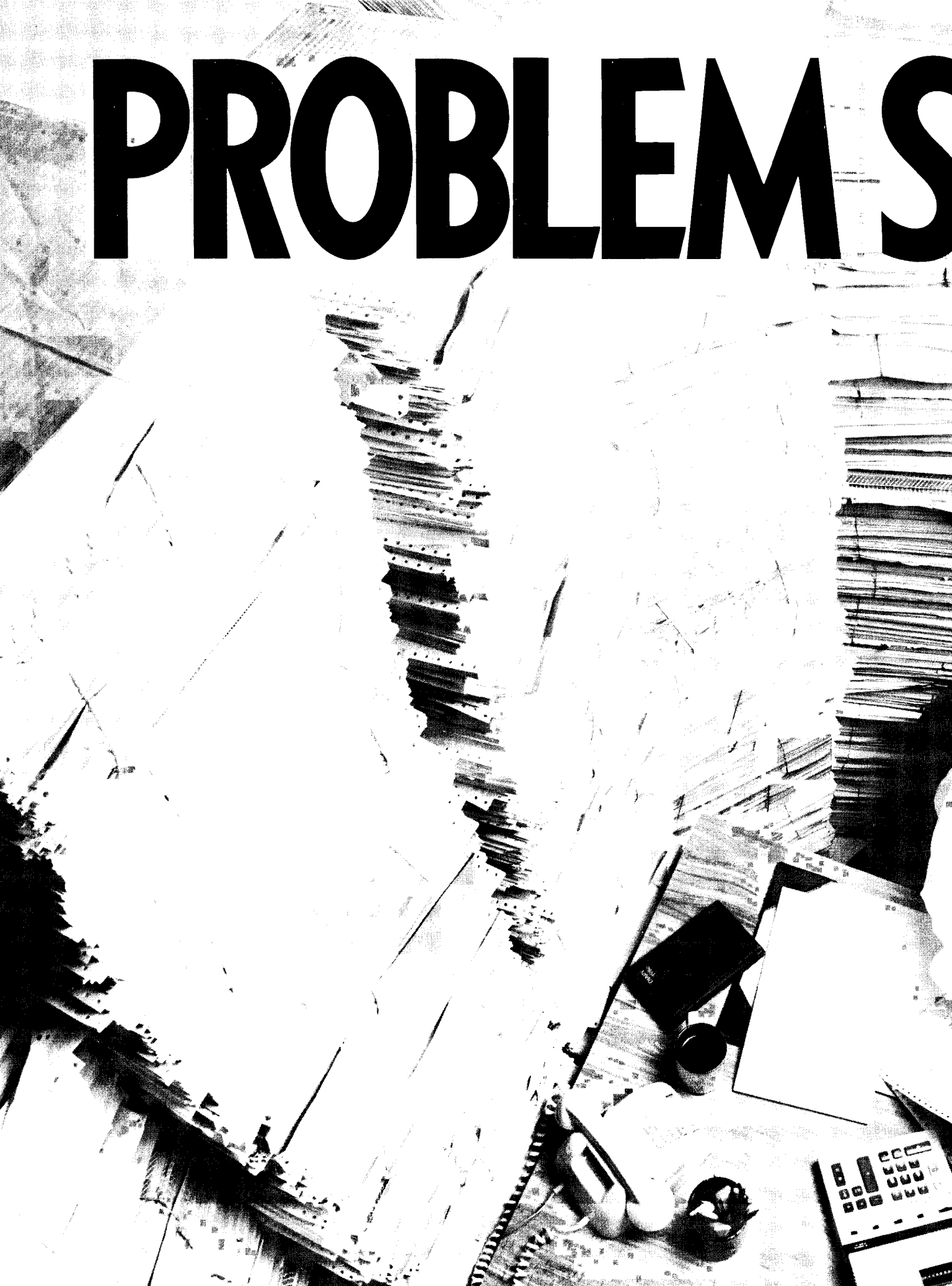

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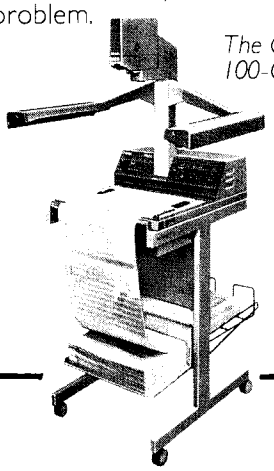

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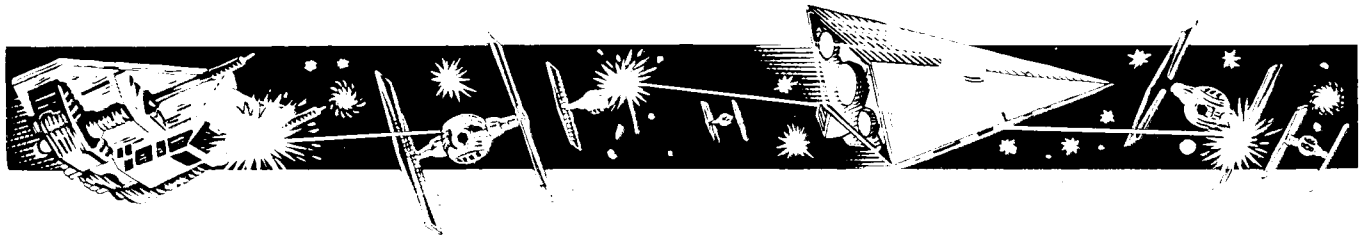
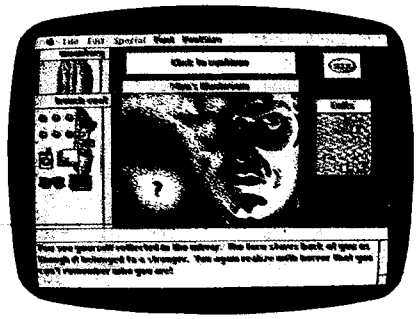
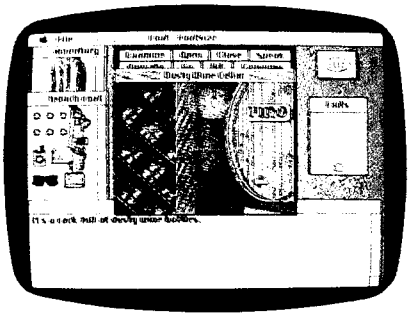


Our regular update of the best leisure software takes a more diverse approach this month, as Stephen Applebaum looks at two unusual and thought-provoking games for the Macintosh.





Ever get that feeling . . .?

GAME: Deja Vu (A Nightmare Comes True)
MACHINE: Macintosh 128k, Mac XL
SUPPLIER: Imagineering
PRICE: $89.95

The ironically-titled Deja Vu is one of a new crop of *avant-garde* games from US-based Mindscape. With its familiar lack of modesty, Mindscape asserts that: 'Deja Vu is like no other adventure you've experienced,' a statement certainly true in my case.

Deja Vu literally decimates the barrier between the action that takes place onscreen and the player's experiences, by allowing interaction with almost everyone and everything appearing in the game's briliantly-drawn screens. Clever exploitation of the Macintosh's versatile screen-handling means that Deja Vu has an infinite number of possibilities, giving the program an air of ambiguity more akin to the real world than a clinical computerised version of what that real world should be.

French in title, but pure Americana, Deja Vu is set in a sleezy underworld which could have come straight from the pen of Raymond Chandler; it's more sordid than apple pie, and full of innuendo and stereotypical characterisation.

The first thought that crosses your mind as you lie on the floor of a squalid toilet in a small downtown bar, is that things can only get better. You stagger out of the room, your brain shot through with a potentially lethal cocktail of truth drugs, hoping to find the antidote and the reason for your being where you are. A farrago of unconnected memories flashes through your head, only to be swallowed up by the chemical pall that has enveloped your mind.

This is the state in which you find yourself at the start of Deja Vu: drugged up to the eyeballs and on the brink of death. Only by finding the cure will you survive long enough to discover who set you up, whose corpse is dumped in the boot of the car ominously parked outside the bar, and who's prowling about your office. Confused? You will be.

Deja Vu's greatest asset is the way in which it grabs the player by the throat, dragging him down into its turgid depths, from the very start; there's little time to orientate yourself before being informed that you're turning into a vegetable — a truly marrowing experience.

Very little of Deja Vu requires the player to touch the computer keyboard, most moves being made via a menu stretching across the top of the screen, obviating wordy typed commands.

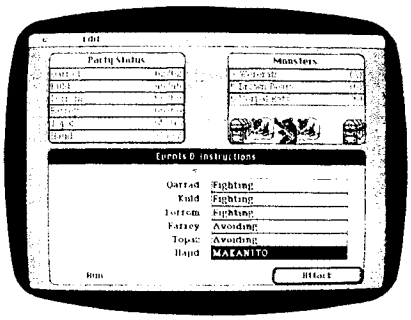
The gathering of objects is a particularly interesting and inventive feature of the game. Using the Macintosh's icons to the full, Deja Vu's programmers have littered the game's various screens with a plethora of items which can be lifted and dragged from one part of the display to an inventory window at the side of the screen. Pointing to Open in the menu, then pointing to an object, allows you to study the window's contents.

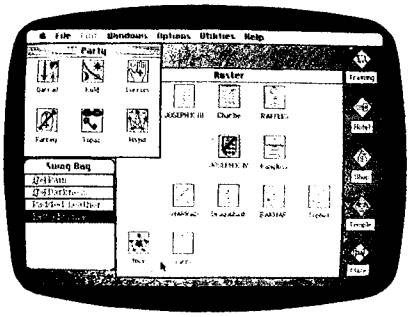
An impressive example of how objects can be manipulated occurs at the beginning of the program. Hanging on the inside of the lavatory door is a large overcoat; relocating the garment in the inventory and then opening it, reveals several smaller icons representing such things as a wallet, an ID card, sunglasses and money. Opening the wallet produces another window displaying its contents. There are so many windows within windows that playing Deja Vu can be akin to dismantling a Russian Babushka.

An option called Operate in the menu enables you to use the equipment which has been diffused throughout the various windows. Operate causes one piece of equipment to have an affect on another: to unlock, say, a door, you'd select a key, click on Operate, and then point to the door in the graphic area of the screen you want to open. Firing a gun is similar in style, except the door becomes the target.

Deja Vu is graphically superb, has a strong storyline, and is, above all else, funny. A wry sense of humour pervades almost every corner of the game, some jokes cropping up in graphical form, while others are subtly inserted into little gems of text; a hooker goes out like a red light when you hit her, while a pet dog bites you and sends you for stitches. Muggers prowl the streets of Chicago and, it appears, always bump into you. One particularly keen character confronts you time and time again, but can be sent off with a right-hander, blackening his eyes and breaking his nose.

Deja Vu is a program beyond reproach. Although it isn't the last word in 16-bit software, it is a massive step forward, and heralds a new era in computer gaming.





Games that wizards play

GAME: Wizardry
MACHINE: Macintosh
SUPPLIER: Imagineering
PRICE: $89.95

In the ephemeral world of computers, it is rare to find a game which has stood the test of time as well as Sir-Tech's Wizardry. It has been at the forefront of the micro-fantasy movement since 1981, diverting, enthralling, challenging and exciting new adventurers in its various incarnations for the past four years.

Wizardry is Tolkienesque, being full of characters with ridiculous names and eccentric lifestyles. Of course there's the obligatory mad megalomaniac, although this time, with a name like Trebor, he sounds as if he could simply be sucked to death. His arch rival is Werdna, an evil wizard with a notorious penchant for helping old ladies half-way across the street and then stealing their purses (a metaphor for the State of the Nation in 1986?)

The future of Wizardry rests precariously on the outcome of the struggle between Trebor and Werdna. To accomplish his plan of world domination, Trebor must first recover a magical amulet appropriated from him by Werdna, who has ensconced himself and the artifact with a skein of tunnels below a fortified town.

The embittered Trebor has instituted an Elite Guard to recover the amulet. Individuals are only qualified to enter this crack force after proving their mettle in Werdna's Maze.

As if there weren't enough creatures in the Maze already, the player must enter it, train his own merry band of psychopaths, and then liberate the amulet from both Trebor and Werdna, hopefully killing the latter in the process.

Characters are initially recruited from the Training Ground in the town. They come in a variety of morphological forms, including the appropriately un-godly Human, Elf, Dwarf, Gnome and (I can't think of anything original) Hobbit. Temperaments are less numerous, ranging from good, through neutral, to evil. Good and evil characters don't mix, so your party of six can only consist of all evil, or all good and/or neutral ones.

Before lumbering a character with an inadequate disposition, players should first peruse the Wizardry manual for information regarding which temperament is the most advantageous for what genus of creature. Applying the wrong one invariably forms a weak link in the party chain, leaving other members to fill the gap.

Six physical and psychological traits determine the class into which a character originally falls and the situations it's best suited to. There are eight different classes, only five of which appear to be accessible from the outset of play: Fighter, Mage, Priest, Thief and Bishop. There's also a Samurai, although that appears to be out of reach, initially. Even higher than the Samurai are the Lord and the Ninja, two forms that can only be reached after many hours of play.

Characters in the three clerical classes can all perform spells of one kind or another and although Priests can only perform Priest spells, and Mages Mage spells, a Bishop can cast both.

The first time I played Wizardry, I sent my party into the Maze under the delusion that they were decked out with the necessary accoutrement for battle. It was like sending a cow into an abattoir with the hope that it would come out in a fit state to produce milk: bare flesh is a hopelessly poor defence against raw steel. With one group already six feet underground, I returned to the Training Ground to recruit another band of hapless souls. This time, however, I took them to the village shop where I bought them designer armour, Emmanual robes and several offensive weapons. I was ready!

Werdna's Maze is depicted as a 3D view along the various corridors. Movement is initiated by pointing an arrow in the direction you want to go, then clicking on the mouse to instigate the move. Entering an area containing beasties turns your arrow into a sword. Small icons representing the foe replace the view of the maze, while a list of your party members appears in the lower half of the screen.

If you surprise the Maze dwellers, the computer gives you the chance to run or engage them in combat. Selecting the latter option allows you to delegate actions to your party members. Only the front three are able to fight, but Mages and Priests can cast spells wherever they are in relation to the *melee*.

First-level clerics (that's those on the lowest level of experience) only have very simple spells which cause the least amount of damage. As they progress up the ecclesiastical ladder, they gain experience and more potent spells. Level seven Mages, for instance, can cast what is termed a 'Titowait', the effect of which can be likened to '. . . a small, well contained, nuclear fusion explosion.'

Money and experience are the rewards for winning a fight. Experience is the more important prize in the early stages of the game, though money becomes all the more necessary as it progresses.

Occasionally, you have to return to the surface to rest your party in the local Hotel. Only here can a character move up a level.

Also on the surface is the Temple of Cant, where the dead can be restored to life — for a small fee, of course. For this very reason, money takes on a greater importance as the adventure continues, especially as the cost of reanimation is always increasing.

There is little more to Wizardry than what I have described here. Most of your time is spent scouring the Maze's various levels for creatures to kill, before finally coming face to face with Werdna. The time spent on this enterprise could be phenomenal, as even at the time of going to press, it is still not clear exactly where the wizard has hidden himself. Our only clue to his whereabouts is the late discovery of an additional five levels, on top of the four we already know about.

Wizardry is brimming over with features which liven up the proceedings, such as designing your own icon when a character reaches the seventh level, and the odd lurid description outlining the painful death of one of your people. Best of all is the way in which teams lost in the Maze can be rescued by more experienced squads, even after the game has been put back onto the shelf for another day.

Carbon Copy

Operate a remote PC over telephone lines as if it were in the same room as you? Ian Davies has a look at this time, energy and money saving product.

Anyone who has tried to support a PC based system from afar knows the difficulties all too well. Vague descriptions of error messages, problems which don't occur on your own machine, intermittent problems and delays in sending data and software upgrades backwards and forwards all serve to make a harrowing experience.

At last along comes a product which addresses all this. Carbon Copy allows two PCs to be connected via modems for the classical support role. One machine is considered the 'remote' PC (the one in need of support), and the other is the "local" PC (the one supporting). Everything which appears on the screen of the remote PC also appears on the 'local' PC (the one supporting). either at the local or remote PC.

The remote PC operates by installing Carbon Copy, running the problem software, and then at the crucial point, pressing the ALT and left shift keys to invoke the link to the remote machine. The local machine runs a different Carbon Copy module which is matched to the remote. Once the connection is established, the two users may enter a "chat" mode to discuss the problem. The remote user can demonstrate his difficulties in the normal way, with the local user looking in via Carbon Copy. Alternatively, the remote user may leave the machine for a while, and let the local support person perform his problem determination.

Additionally, an extension called CCDOS allows file transfers to be done between the machines. This might be to capture the remote users test data, or to send him a new release of the software. CCDOS effectively makes another set of disk drives appear on the support machine, for example, RA:, RB: and RC: would be remote drives, whereas LA: and LB: might be the local drives. Using normal DOS style commands (TYPE, DIR, CHDIR, MKDIR, DELETE, RENAME), files can be manipulated on either machine, or transferred using COPY. Carbon Copy actually emulates DOS, it does not interface to it, thus the facilities provided by CCDOS are not 'full DOS'. Remember, however, that 'full DOS' can be accessed just by exiting the application software in the normal way — CCDOS is specifically for file transfers.

> *'Everything which appears on the screen of the remote PC also appears on the local PC.'*

Error detection and automatic retry are included in CCDOS.

A full set of windows is provided for connection and disconnection of calls, screen capture, mode selection and the like. A remote directory can be set up for autodial modems, accessed simply by name. Passwords can also be set.

OK, it sounds great, but how well does it work?

I guess a lot of PC technocrats have thought about knocking together this type of facility at one time or another, and therefore would be aware of the problems which stand in the way — for example, products which write directly to video memory rather than using the DOS TTY interrupt — as 90% of good PC software does. Carbon Copy actually handles this by transmitting direct from video memory, rather than intercepting DOS calls. Pretty clever, eh? Now obviously the next problem with this approach is speed. Carbon Copy is pretty clever in this area too, as it only transmits those portions of the screen which have actually changed. This means that even full screen editors have acceptable performance.

This approach yields a certain amount of inherent optimisation; for example, if a

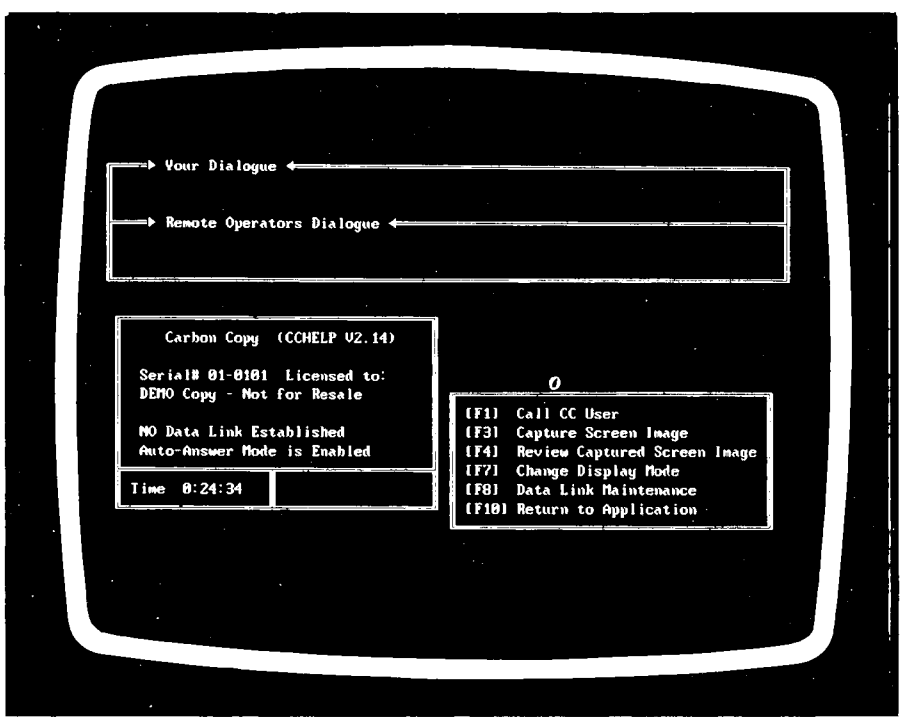


Fig 1: the Carbon Copy control screen

Lotus 1-2-3 command such as "/WCS" is used, the intermediate menus are not transmitted, just the final one. Additionally, the handling of blanks seems to be optimised.

Carbon Copy works fine with dBASE III, Multimate, Lotus and a number of other software products tried. SPF/PC, however, although it started correctly, violently killed the machine when an attempt was made to actually edit a file. Carbon Copy can also transmit the graphics adaptor memory, although it only does this upon request, since 16k is rather bulky. To test this, I tried Flight Simulator and JET. Both crashed the machine. Not really surprising, and quite unreasonable to expect it to work, as few people would be interested in running JET between Melbourne and Sydney.

'To test this, I tried Flight Simulator and JET. Both crashed the machine. Not really surprising, and quite unreasonable to expect it to work, as few people would be interested in running JET between Melbourne and Sydney.'

Configuration options include transmission speed, modems and screen type, which is particularly handy on Olivetti M24s. Speeds of up to 9600 bps are supported, but since most users would have (at best) 1200 bps modems, I restricted my speed to that. Even at a lowly 1200 bps, the performance was acceptable.

Conclusion

To sum up its performance, Carbon Copy is not magic. However, it does work as well as a product of this type could reasonably be expected to, perhaps even a little better than that. You cannot approach it without at least some idea of communications concepts; however, if you understand the idea of two machines talking, then Carbon Copy is a breeze. While it does not work flawlessly with all software, it seems to operate correctly in most cases. The best thing to do, as always, is try before buying it to ensure that it works with the software relevant to you.

Carbon Copy is not a replacement for the Crosstalks of the world — it complements Crosstalk very nicely.

I know that many corporations need to support their remote users from a central facility, and for them Carbon Copy will be welcomed with open arms. Likewise, for any software developer, Carbon Copy can save time, reduce courier costs and site visits, and generally make the whole process a lot less painful — even if your client is only across town.

Carbon Copy runs on IBM PCs and compatibles, and requires, of course, a modem at either end. Its recommended retail price is $395 which, while rather expensive, should pay for itself by the elimination of one interstate flight.

For anyone in a support role of any type, Carbon Copy is a must. I know I won't be without it next time one of my systems goes interstate.

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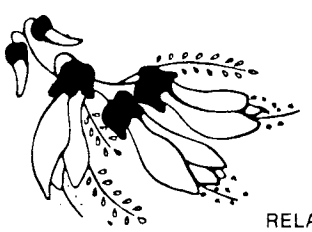

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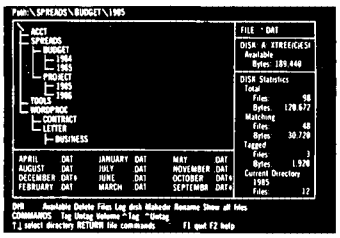

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Comal 80

Comal 80 is an alternative language cartridge for the Commodore 64. Described as a "cross between Basic and Pascal", it is targeted mainly at the educational market. Ian Davies takes a look.

The Commodore 64 has always been a fascinating machine in a morbid sort of way. On the one hand, it provides some of the best hardware to be found on any machine — the VIC and SID chips are just amazing in what they can do. Yet on the other hand, it supports a Basic which belongs in the dark ages. Apart from being a 1970 quality Basic, it offers absolutely no support for all the great hardware on board. This means that if you want to do graphics, sound or sprites, the task is a daunting one.

Even if all you want to do is delete a file from the disk, the command is OPEN 1,8,15, "S0:filename" — ridiculous. Honestly, I've tried doing high resolution graphics on the Commodore 64, and it's a thoroughly humbling experience. The frustrating thing from the beginner's point of view is that all the commercial software makes great use of the hardware, so it's a tantalizing taste of what can be done. Even when you do manage to get some high resolution graphics working, next thing you know your program has crashed, and you can't read any of the error messages because the screen is in the wrong mode. It's just crazy.

The point is, all beginners want to do colour, sound, graphics and animation. But when a thorough familiarity with binary, modulo arithmetic, device registers, screen mapping mechanisms and bit twiddling is required before even the most elementary experiments can be done, this acts as an enormous barrier. Suddenly the beginner cannot do all those nifty things he would like to do and, except for the very keen, becomes discouraged.

If you think I'm overstating the situation, let me tell you that the chapter on sound in the 'Programmers Reference Guide' (a weighty manual, but essential to anyone who wants to do anything with the 64), introduces the subject by saying that the basic concept for sound generation is "POKE MEM, NUM". Most 64 programs consist of 70 per cent POKE and PEEK statements. The result is totally unreadable, unmaintainable, and almost unwritable. It's just not computer science — it's hacking.

'Based on the ideas of Niklaus Wirth, the designer of Pascal, two Danish academics, Borge Christensen and Benedict Loftsted attempted to design a language which embodied all the good things about both Basic and Pascal.'

What is obviously required is a better Basic. I know there are many language enhancements around for the Commodore 64 which provide new statements and functions to make all this easier, but they do not address the problems inherent in an antiquated Basic.

Similarly, other languages are available for the Commodore, including Forth, Pascal, Logo and Prolog. However, many of these languages do not provide the convenient and immediate environment which a Basic interpreter generally does. Comal 80 was designed to address all of the above.

Based on the ideas of Niklaus Wirth, the designer of Pascal, two Danish academics, Borge Christensen and Benedict Lofsted attempted to design a language which embodied all the good things about both Basic and Pascal. Throughout the 1970's, they designed and implemented their ideas. Finally, with the assistance of an international committee, a Comal kernal was agreed on. This kernal was to be standard on all implementations of Comal, although specific implementations, such as the Commodore 64, could enlarge upon the standard to take advantage of whatever extra facilities the machine offered.

The Commodore 64 version of Comal was developed by a Danish company called UniComal Aps, in co-operation with the Danish Commodore distributor.

Comal 80

So is it really a cross between Basic and Pascal? Me thinks not. It's more like Basic the way it should have grown over the last twenty years.

One of the most apparent features of Comal is that although line numbers are used, they are never referenced. This means that numbering can be used for listing, insertions, deletions and the like, but all subroutine calls and GOTOs are by name. This, of course, makes programs about a great deal more readable and removes the renumber problem found in so many Basics.

By dispensing with line number references, Comal also allows itself to be structured. This means that it becomes

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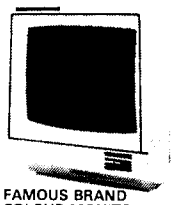

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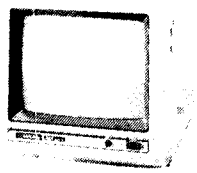

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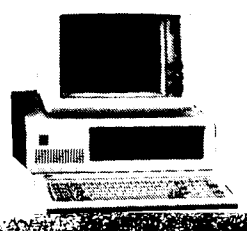

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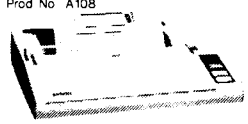

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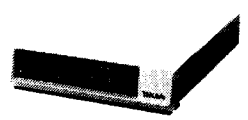

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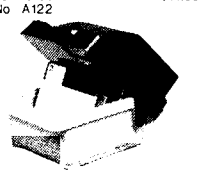

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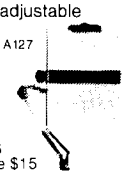

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very hard to write the 'spaghetti' code most learners and hackers manage to produce effortlessly under normal Basics. Instead, discrete procedures and functions are defined for doing discrete units of work. These are then used within other procedures, and so on. Structured programming is the cornerstone of Pascal, PL/I and Algol, among others. There are those who would say that Cobol also encourages structured programming, but this is not true — due to the non-existence of parameters.

Comal also provides a rich collection of control structures, including the block if-then-else, which means that both the 'then' and 'else' actions in an 'if' statement can be as many statements as you like. This single feature does more to eliminate spaghetti code than anything else.

Full recursion is supported — another important feature for any understanding of algorithms, as against hacking out code. Procedures and functions support parameters of both value and reference types, and can include local variables. Additionally, procedures and functions may be CLOSED, which means that variables outside the module cannot be accessed within the module, unless passed as parameters or IMPORTed.

This all sounds very Pascal-like, and indeed it is. But, as any true devotee of Pascal well knows, the real feature which characterises Pascal is its typing. Pascal allows not only integers, reals, arrays and files, but also sets, records, booleans, subranges and user defined scalar types. Moreover, these types can be combined to create user-defined types, for example, a file of records which contain an array of sets, a record of arrays, and so on. By providing strict type checking in conjunction with user defined types, Pascal manages to detect many programming errors in the compilation stage.

Comal provides no such typing. It supports integer, reals, strings, arrays and files — with no ability to define your own types. It looks as though this decision was made primarily to dispense with the need for variable declaration. Many people detest having to declare variables before use. Personally, I detest spending hours tracking down a bug only to find that it was caused by miskeying a variable name, and so Basic assumed zero. Comal sits somewhere between these two extremes. It does not require you to predefine variables (except arrays), but it does detect uninitialised variables. The type of variable is indicated by a suffix character, a la Basic, that is, $ for strings, # for reals and nothing for integers. You cannot have two variables of the same name but different types, for example, 'A$' and 'A#'.

All identifiers may be up to eighty characters in length, and although the manual recommends the use of the quote to separate long names, Comal also allows the more usual underscore, for example, INVOICE_NUMBER.

'Although Comal was designed to be an interpreted language, it actually happens to be semi-interpretive, and this is another important feature.'

Control structures provided include Repeat ... Until, While do ... Endwhile, For to step do ... Endfor, Loop ... Exit ... Endloop, If ... Then ... Elif ... Else ... Endif and also Case of ... When ... Otherwise ... Endcase. The Elif part of the If statement is equivalent to a normal Else If. The Case statement is rather interesting, as well as providing the normal Pascal style Case facility of testing an expression against a number of values, it can also be used to select between a number of quite independent conditions. The Loop structure is also interesting. It effectively creates an infinite loop, which can be broken out of at any point through an Exit statement.

Many of the non-control statements are very Basic-like. For example, Input, Print, Print at, Open, Close, Run, List, Read and Data. This is probably a good thing, as most Comal users would have been previously contaminated by Basic.

One of the key features of Comal is that of 'packages'. Through the Use command, various packages can be invoked which activate language extensions for machine specific features. Although it is possible to write your own packages, most people would have little need to, as the standard packages are more than adequate, including graphics, sprites, turtle, sound, system, font, joystick, and several others. Packages can be 'Discarded' when no longer needed. This facility will be examined later.

'Among its rationalisation of Commodore 64 conventions, Comal also attacks the file access system.'

Comal also implements normal system type commands, such as Load, Save, Dir, List, Merge, Run and Chain. Also, file manipulation commands such as Copy, Rename and Delete are provided. All of these commands have been normalised (they work as they would on a normal machine), so just typing 'Run "Demo"' will load from disk or cassette and start running. For special operations, 1541 fanatics can still send cryptic commands to the disk drive using Pass. Program manipulation commands are also provided, including Edit, Find, Change, Del, New, Auto and Renum. Remember, however, that Renum does not have to adjust line number references, since there aren't any.

Although Comal was designed to be an interpreted language, it actually happens to be semi-interpretive, and this is another important feature. Automatically before a Run, Comal scans through the program to check for structuring errors, builds tables of variable, procedure and function names, converts keywords to upper case, and annotates all End type statements to clarify their scope. This scan can also be initiated upon demand using the Scan command.

Not only does this enhance execution speed, but it also allows more complex errors to be detected.

All diagnostics are displayed in English, even diagnostics produced from the 1541.

On the Commodore 64

As mentioned, machine specific enhancements are implemented through Comal packages. For the Commodore 64, these provide a host of useful procedures and functions which allow you to really get the most of the hardware you've paid for.

The graphics package allows selection of high resolution or medium resolution with multiple colours. Functions keys can be used to switch from graphics to text, or you can split the screen. Full 'viewporting' is provided, and a Window procedure allows any coordinate system to be used. As well as full control over foreground, background and border colours, the colour of any individual pixel can be sensed programatically. Pixels can either be activated and deactivated individually, or groups can be affected through the Draw procedure. There are even Circle and Arc procedures, as well as Fill and Paint facilities.

The turtle package is really an extension to the graphics package, and allows Logo style commands, including

Setheading, Penup, Pendown, Left, Right, Foreward, Back and Arcl. Additionally, the turtle can be hidden, revealed or changed in size. Wraparound can be selected as desired. One very neat feature is for the display of text. Not only can the text be displayed in any of four directions, but its size can also be adjusted, thus making large headings a breeze.

One of the very important features of the graphics package is that if your program crashes, or you interrupt it, you are returned to the text screen -- not left in graphics mode.

Sprites are one of the more powerful and exciting facilities found on games machines like the Commodore 64. Comal provides yet another package to make these easy to use. Sprites are described using the Define procedure, which accepts a drawing number and a string describing its shape. The drawings (up to 32), are then allocated to particular sprite numbers using the Identify procedure. These allow a repertoire of shapes, and it is possible to switch between them very rapidly.

In addition to the Spritesize and Spritecolor, Spritepos can be used to position the sprite at any point on the screen. More importantly, however, the Movesprite procedure will start a sprite moving without any further action on your part. Once the Movesprite procedure is executed, your program continues immediately, and the sprite will automatically move to the required destination at the speed you specify. A function is provided to check whether the sprite is still in motion.

To complement Movesprite, the Animate procedure effectively lets you program each sprite independently. A command string is passed to the sprite which it executes repeatedly until told to stop. This, for example, lets you move a sprite from one side of the screen to the other, flashing and changing colour as it goes, all with only two lines of code, and all happening while the rest of your program continues.

A Priority procedure allows you to determine what happens when a sprite passes in front of some graphics, and two Collision procedures provide facilities for detecting wrangles. A general sprite enquiry function allows 15 different properties of sprites to be interrogated. Sometimes it is desirable for a sprite to be copied on to the graphics screen so that the sprite number can be reused for other moving objects. In these situations, the Stampsprite procedure achieves the desired result in a single line of code.

The sound package provides full control over the SID chip through another set of procedures and functions. As well as Volume and Note procedures, the programmer can exercise control over gating, wave shapes, attack, sustain, decay and release. Any of the three voices can be synchronised. Control is also provided over frequency, filter types and widths, resonance and pulse duty cycle. Notes are expressed either using numbers, or strings such as c5#. As with the sprite procedures, the sounds can run while your program continues executing other statements.

The control port packages provide standard interfaces for sensing joysticks and game paddles. The lightpen packages allows you to read the pen position, set sense latency and control accuracy requirements.

A miscellaneous package, called System, provides procedures for controlling Comal defaults, such as the format of listings, setting and getting the time of day, defining function keys, controlling printer attributes, including translation of characters from Commodore 64 into ASCII.

Finally, the font package provides interfaces for defining your own character set. Character fonts can be retrieved from the standard character set into variables, or may be set from variables. Font tables can also be saved to disk and restored by a single statement.

Among its rationalisation of Commodore 64 conventions, Comal also attacks the file access system. As well as the disk, other devices can be accessed using a sensible notation, for example, kb: for the keyboard, ds: for the display screen, lp: for the line printer, sp: for the serial port and cs: for the cassette. Thus opening the serial port for communica-

Commands:	NEW	AUTO	RENUM
	EDIT	FIND	CHANGE
	DEL	SCAN	SETEXEC
	SIZE	CAT	DIR
	LIST	DISPLAY	ENTER
	MERGE	SAVE	LOAD
	RUN	CHAIN	CON
	STATUS	VERIFY	COPY
	RENAME	DELETE	PASS
Statements:	SELECT INPUT	SELECT OUTPUT	SYS
	USE	LINK	DISCARD
	INPUT	INPUT AT	KEY$
	PRINT	PRINT AT	PRINT USING
	ZONE	PAGE	CURSOR
	READ	DATA	RESTORE
	EOD	MOUNT	CREATE
	OPEN	READ	WRITE
	APPEND	CLOSE	UNIT
	IF	THEN	ELSE
	ELIF	ENDIF	CASE OF
	WHEN	OTHERWISE	ENDCASE
	REPEAT	UNTIL	WHILE DO
	ENDWHILE	FOR TO	STEP
	ENDFOR	LOOP	EXIT
	ENDLOOP	TRAP	HANDLER
	ENDTRAP	REPORT	GOTO
	PROC	ENDPROC	REF
	CLOSED	IMPORT	EXTERNAL
	MAIN	FUNC	ENDFUNC
	RETURN	RANDOMIZE	TRAP ESC
	TRACE	DIM	POKE
	NULL	STOP	END
Functions:	SGN	ABS	INT
	ERRTEXT$	ERR	ERRFILE
	SQR	PI	COS
	SIN	TAN	ATN
	LOG	EXP	CHR$
	STR$	SPC$	ORD
	VAL	LEN	TRUE
	FALSE	TIME	RND
	ESC	DIV	MOD
	NOT	AND	AND THEN
	OR	OR ELSE	IN
	BITAND	BITOR	BITXOR
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Table 1: features of Comal 80

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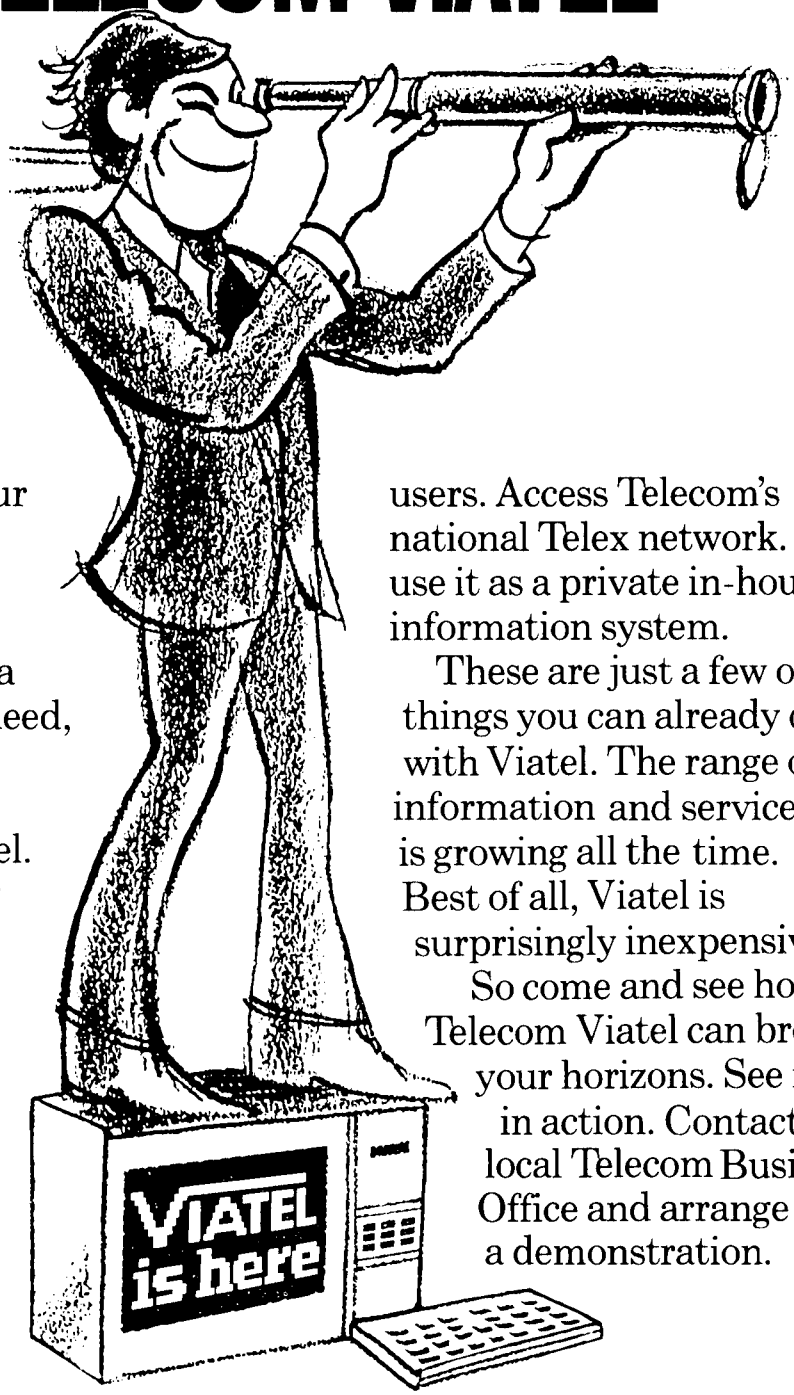

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tions is as easy as OPEN FILE 1, sp:b1200d8sipe, for baud=1200, data bits=8, stop bits=1, parity=even.

Documentation

As Comal is targeted at the education market, the quality of its documentation is of the utmost importance.

In general the manual is good. It is a reduced dot matrix print in a ring binder, and although it must have been translated from Danish, it bears no marks from the experience.

The philosophy of the manual is to introduce a new topic and cover most of the concepts using actual code segments by way of example. The various statements and functions are introduced and explained as required. It then goes back and covers all of the facilities pertaining to that topic in detail — exploring all the options and introducing advanced facilities. Generally, about 30 per cent of any section is used for the introduction, and the remainder for the detailed review. The quality of the introduction is such that often it does not seem necessary to read the details. Thus they manage to tread the fine line between tutorial and reference.

A set of symbols are explained in the first few pages and are then used to highlight various areas of the text, for example, the 'watch out' symbol is a dark circle with a drawing of a foot about to slip on a banana peel.

At every opportunity, the manual attempts to explain the 'why's' as well as the 'how's'. For example, the section on serial communications explains what an RS-232C port looks like and how it works. All good stuff.

Examples abound throughout the manual, including sample programs in an appendix. The software itself is provided on a cartridge, but a disk is provided which contains all of the major examples used in the book, as well as a few extra ones.

There are really only two things lacking in the manual. First, it needs a better index. Many of the procedures and functions described in the text are not indexed. Second, it lacks a keyword table and syntax chart. These are not major shortcomings, and in general the manual serves very well as an educational tutorial/reference manual.

Conclusion

Comal 80, although not a version of Pascal, certainly addresses all of the problems with using Basic as an educational tool. It is structured, it allows long identifiers, user defined procedures and functions with local variables, parameters and recursion. It does not reference line numbers, and it discourages spaghetti code.

As well as being a better language, Comal 80 also provides all the extensions you could ever want to take advantage of what the Commodore 64 can do. Suddenly, animation and graphics become a snap. In particular, the simulated 'multi-tasking' provided by the language makes it infinitely easier to have several things going on at once at a reasonable speed.

Programs, while doing all these fancy things, are easy to write, easy to read, and easy to get right. There is virtually no requirement for PEEKs, POKEs or machine code.

For the education market, Comal 80 makes the Commodore 64 a really viable machine. Even for the home market, Comal 80 makes the Commodore 64 a pleasure to use. If you've got a Commodore 64 at home and want to write programs which look like the professional stuff, take a look at Comal 80. END

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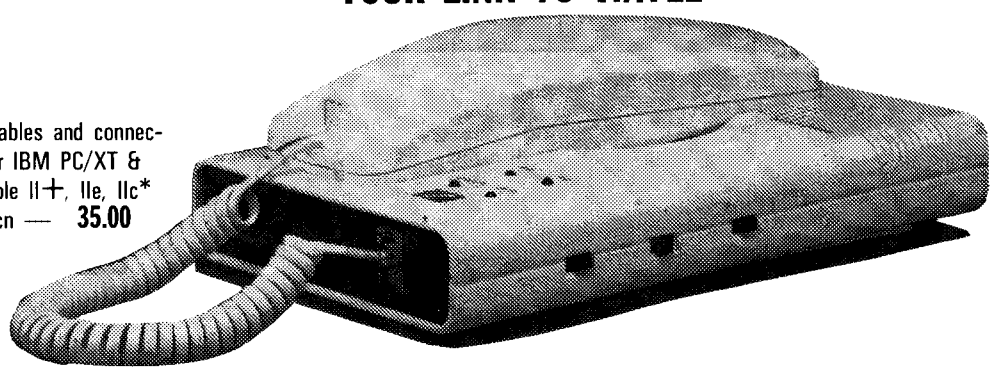

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Unsolved problem

No matter the number or complexity of tasks a computer can perform, until it becomes 'self-aware', the computer's ability to solve problems will depend on its programmer's own knowledge and ingenuity; expert systems are a step in the right direction but they still need to be told 'how' to solve the problem. Owen Linderholm examines current problem-solving techniques and argues whether or not computers can ever be 'truly' intelligent.

If you were to stop to consider each of the difficult and complicated problems you solve rapidly and efficiently every day, you would probably spend more of your time *staring* pensively at the sky than *doing* anything. Every conscious action you take involves problem-solving of some kind, even if it just involves applying an already tried and tested solution. When you cross the road, you make a series of rapid judgments and decisions about a complex situation with many variables. Is there a car or bike coming? If so, how fast is it going and will you be able to get safely across before it arrives? You instantly make up your mind and do one of two things: either cross the road confidently and safely; or wait, continually reassessing the situation, until it is safe to do so.

The above example shows how often we spontaneously solve problems in daily life without too much thought. Other situations, with which we are less familiar, may be easier to solve but we may find them more difficult because we have not developed automatic mechanisms to solve them. Simple logic puzzles of the type found in puzzle magazines involve far fewer variables and possibilities, but most people take quite a long time to solve them compared with how long they take to decide whether or not to cross the road.

Consider how a computer would solve the above problem. The computer needs some sort of mechanism:

— for detecting the presence, distance and speed of moving objects;

— for detecting the presence of stationary objects; and

— for moving and changing direction, and speed and knowledge of how fast it can move.

It needs to be able to predict where cars will be. It needs to know where it is trying to get to and it needs to know how it can get there. From this information, it must then formulate a plan of action which is guaranteed to get it across the

```
?POALL
TO PROBLEMSOLVE
PRINT [Enter rule]
MAKE "RULE RL
MAKE "TLIST [] MAKE "INITPOS [] MAKE "FINPOS [] MAKE "LEGMOVES []
PRINT [Enter initial position as 3 lists (A,B,C) :]
MAKE "INITPOS RL
MAKE "LOC1 FIRST :INITPOS MAKE "LOC2 ITEM 2 :INITPOS MAKE "LOC3 LAST :INITPOS M
AKE "INITPOS (LIST SORT :LOC1 SORT :LOC2 SORT :LOC3)
PRINT [Enter final position as 3 lists (A,B,C) :]
MAKE "FINPOS RL
MAKE "LOC1 FIRST :FINPOS MAKE "LOC2 ITEM 2 :FINPOS MAKE "LOC3 LAST :FINPOS MAKE
 "FINPOS (LIST SORT :LOC1 SORT :LOC2 SORT :LOC3)
PRINT [Enter list of legal moves]
MAKE "LEGMOVES RL
MAKE "DONE "FALSE
MAKE "CURRPOS :INITPOS
MAKE "PREVPOS [] MAKE "PREVPOS FPUT :INITPOS :PREVPOS
PRINT [Start] PRINT :INITPOS
TRYMOVES :LEGMOVES
IF :DONE [PRINT :FINPOS PRINT [Success]] [PRINT [Failed]]
END
TO TRYMOVES :LISTMOVES
IF EMPTYP :LISTMOVES [PRINT [Backing up...] STOP]
CHECK :CURRPOS FIRST :LISTMOVES
IF :DONE [STOP]
TRYMOVES BUTFIRST :LISTMOVES
END

TO CHECK :CURRPOS :CURRMOVE
IF NOT (APPLICABLE) [STOP]
PERFORMMOVE
IF NOT (SATISFIED) [BACKUP] [IF MEMBERP :CURRPOS :PREVPOS [BACKUP STOP] [IF EQU
ALP :CURRPOS :FINPOS [MAKE "DONE "TRUE STOP] [PRINT :CURRPOS MAKE "PREVPOS FPU
T :CURRPOS :PREVPOS TRYMOVES :LEGMOVES]]]
END
TO PERFORMMOVE
MAKE "TEMPMOVE :CURRMOVE
MAKE "LOC1 FIRST :CURRPOS
MAKE "CURRPOS BUTFIRST :CURRPOS
MAKE "LOC2 FIRST :CURRPOS
MAKE "LOC3 LAST :CURRPOS
MAKE "TOLOC LAST :TEMPMOVE
MAKE "TEMPMOVE BUTLAST :TEMPMOVE
MAKE "FROMLOC LAST :TEMPMOVE
MAKE "TEMPMOVE FIRST (BUTLAST :TEMPMOVE)
MAKE "TEMPMOVE SORT :TEMPMOVE
IF (EQUALP :FROMLOC [1]) [MAKE "LOC1 REMOVE :TEMPMOVE :LOC1]
IF (EQUALP :FROMLOC [2]) [MAKE "LOC2 REMOVE :TEMPMOVE :LOC2]
IF (EQUALP :FROMLOC [3]) [MAKE "LOC3 REMOVE :TEMPMOVE :LOC3]
IF (EQUALP :TOLOC [1]) [MAKE "LOC1 SE :LOC1 :TEMPMOVE]
IF (EQUALP :TOLOC [2]) [MAKE "LOC2 SE :LOC2 :TEMPMOVE]
IF (EQUALP :TOLOC [3]) [MAKE "LOC3 SE :LOC3 :TEMPMOVE]
MAKE "CURRPOS (LIST SORT :LOC1 SORT :LOC2 SORT :LOC3)
END
TO APPLICABLE
MAKE "TLOC [] MAKE "ANSWER "FALSE
MAKE "FROMLOC ITEM (COUNT :CURRMOVE) - 1 :CURRMOVE
MAKE "CHECKLOC ITEM FIRST :FROMLOC :CURRPOS
MAKE "CHECKELTS FIRST :CURRMOVE
IF OR (EMPTYP :CHECKLOC) (EMPTYP :CHECKELTS) [OUTPUT "FALSE]
OUTPUT APPNEXT :CHECKLOC :CHECKELTS
END

TO APPNEXT :LOC :ELTS
IF EQUALP FIRST :LOC FIRST :ELTS [MAKE "LOC SE BUTFIRST :LOC :TLOC MAKE "ELTS B
UTFIRST :ELTS MAKE "ANSWER "TRUE] [MAKE "TLOC SE FIRST :LOC :TLOC MAKE "LOC BU
TFIRST :LOC]
IF EMPTYP :ELTS [OUTPUT :ANSWER]
IF EMPTYP :LOC [OUTPUT "FALSE]
APPNEXT :LOC :ELTS
END
```

Program listing for missionary-and-cannibals problem

Missionary-and-cannibals listing inued

```
TO SATISFIED
IF RUN :RULE [OUTPUT "FALSE] [OUTPUT "TRUE]
END

TO NUMBERAT :BLOCK :LOCN
MAKE "VAL 0
OUTPUT COUNTUP :BLOCK :LOCN
END

TO COUNTUP :BLOCK :LOCN
IF EMPTYP :LOCN [OUTPUT :VAL]
IF EQUALP FIRST :LOCN :BLOCK [MAKE "VAL :VAL + 1]
COUNTUP :BLOCK BUTFIRST :LOCN
END

TO REMOVE :LISTA :LISTB
MAKE "TLIST []
OUTPUT REMNEXT :LISTA :LISTB
END

TO REMNEXT :LISTA :LISTB
IF (OR EMPTYP :LISTA EMPTYP :LISTB) [OUTPUT SE :LISTB :TLIST]
IF EQUALP FIRST :LISTA FIRST :LISTB [MAKE "LISTA BUTFIRST :LISTA] [MAKE "TLIST
SE :TLIST FIRST :LISTB]
MAKE "LISTB BUTFIRST :LISTB
REMNEXT :LISTA :LISTB
END

TO BACKUP
MAKE "TEMP LAST :CURRMOVE
MAKE "CURRMOVE BUTLAST :CURRMOVE
MAKE "TEMP2 LAST :CURRMOVE
MAKE "CURRMOVE (LIST FIRST :CURRMOVE :TEMP :TEMP2)
PERFORMMOVE
END

?



?PROBLEMSOLVE
Enter rule
OR (AND (> NUMBERAT "C :LOC1 NUMBERAT "M :LOC1) (> NUMBERAT "M :LOC1 0)) (AND (>
 NUMBERAT "C :LOC2 NUMBERAT "M :LOC2) (> NUMBERAT "M :LOC2 0))
Enter initial position as 3 lists (A,B,C) :
[B C C M M] [] []
Enter final position as 3 lists (A,B,C) :
[] [B C C M M] []
Enter list of legal moves
[[B M] [1] [2]] [[B M] [2] [1]] [[B C] [1] [2]] [[B C] [2] [1]] [[B M M] [1] [2]
] [[B M M] [2] [1]] [[B C C] [1] [2]] [[B C C] [2] [1]] [[B C M] [1] [2]] [[B C
M] [2] [1]]
Start
[B C C M M] [] []
[C M M] [B C] []
Backing up...
[C C] [B M M] []
Backing up...
[M M] [B C C] []
[B C M M] [C] []
[C M] [B C M] []
Backing up...
[C] [B C M M] []
[B C M] [C M] []
[] [B C C M M] []
Success
```

road without damage. Nevertheless, the computer that could do all this would still do some silly things. Imagine a robot approaching a dangerous and busy road, pausing and eventually crossing, all the while ignoring the zebra crossing, the overhead crossing and the nearby subway. Human beings have all this knowledge from past experience, and are consequently able to reduce the problem's complexity to consideration of a few simple variables.

If mankind were less capable of solving problems than it is, then it is unlikely that civilisation would have progressed very far. Indeed, our ability at problem-solving may have contributed enormously to our survival in the evolutionary rat-race. It is obvious that a link can be made between our ability to solve problems and intelligence. As a result, problem-solving ability is seen as a way of measuring progress in artificial intelligence as well as a major research field in its own right.

Discipline

In 1945 a mathematician named George Polya published an excellent book called *How To Solve It: A New Aspect Of Mathematical Method.* This book introduced the idea of problem-solving as a discipline which had methods that could be used to improve speed and efficiency. It is a serious study of these methods and is presented as a tutorial, including an extensive 'dictionary' of problem-solving and a selection of example problems to solve with solutions and commentary. *How To Solve It* introduced the idea of heuristic to a wide audience (heuristic means 'serving to discover', and in the context of problem-solving refers to the study of methods of discovery and invention. The term is generally used to refer to a technique which improves efficiency — but may sacrifice completeness to this end).

Polya gave four basic rules for problem-solving. These are:

(1) Understanding the problem: before you can begin to solve the problem, you must fully understand it. What do you need to find out? What facts do you know and what are the conditions?

(2) Devising a plan for solving it: you need to find a connection between what you have been told and what you need to know. Have you seen a similar problem before? Can you use some of the information from it to solve this problem? If you can't, can you rearrange the problem into something you can solve? You will need to make use of everything you do know that can be related to this problem.

(3) Carrying out the plan: try out the solution, checking that it is correct at every step. Can you show that it is definitely correct at each step?

(4) Looking back: look at the solution you have obtained. Is it correct? Can you improve on it? Can you use this method on other similar problems?

Some similarities of approach can be observed between this method and the one previously described for getting a computer across the road. Obviously Polya's rigorous approach is a sensible one and is a very good starting point from which to look at problem-solving by computer.

Experience

One of the most obvious and simple problem-solving methods for people is given in the aforementioned four stages: this is to solve problems by analogy with a similar problem already encountered. We do this all the time, drawing upon our vast experience of the real world and practical problems. It will be years, *if ever*, before computers can *learn* how to do this, let alone connect information together. This means that the details of a problem and the framework in which it can be solved need to be spelled out to a computer. Nevertheless, computer problem-solvers now have considerable power.

SE Fahlman's program 'BUILD' can solve problems of the following kind. Look at the example in Fig 1. You must build the second set-up from the blocks in the first. Remember that this is taking place in the real world. A good way to go

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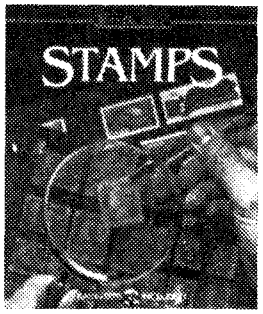

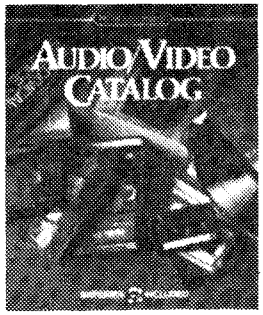

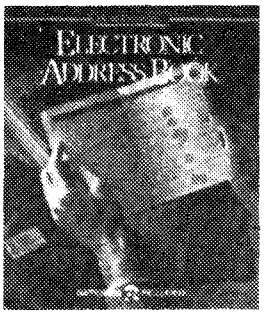

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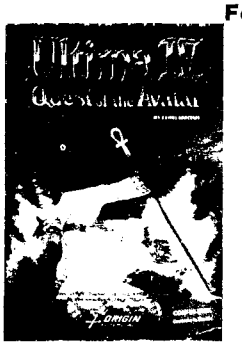

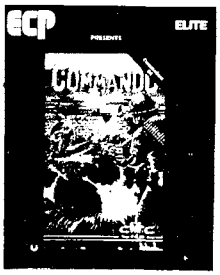

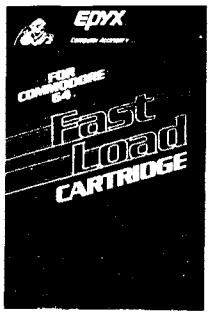

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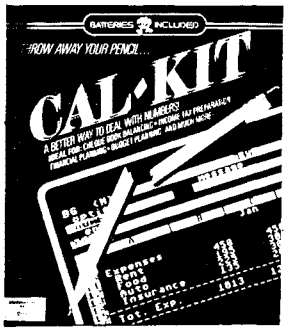

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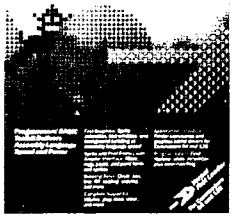

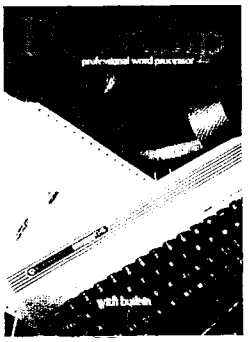

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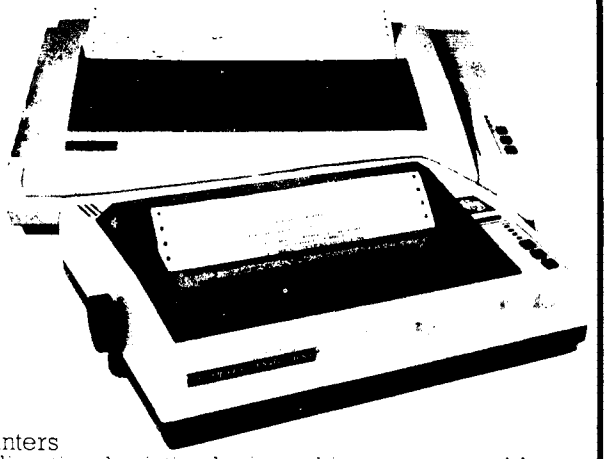

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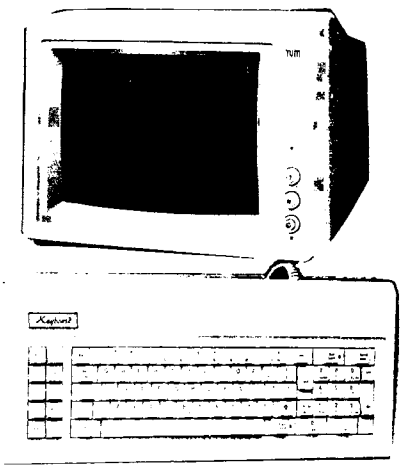

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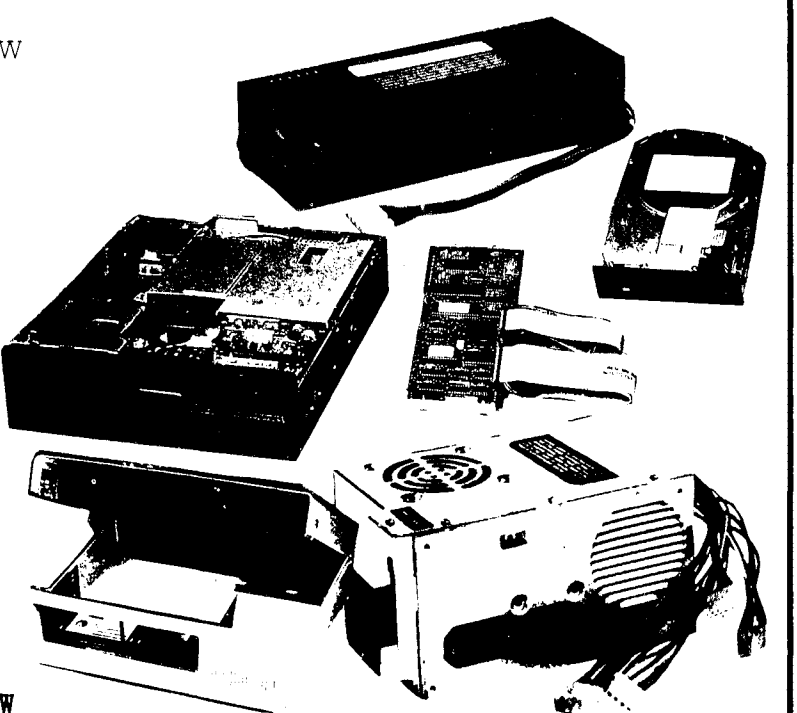

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about it is to experiment with real blocks similar to those in the diagram. You are only allowed to use one hand, hold one object, and to move blocks you must pick them up from the surface and place them where you want them to be.

BUILD realises that if you directly place the blocks as in the second set-up, at one point the structure you build will overbalance because the horizontal bar acts as a seesaw. It gets around this by placing the second small block under the horizontal bar at the place where the first vertical bar will go, which holds up the structure until the second vertical bar can counterbalance the first. This leaves the position in Fig 2. Finally, the small block is removed to leave the desired structure.

BUILD has a great deal of knowledge about the physics of the real world and solves the problem completely in its 'mind', without being able to try out different possibilities. This example is taken from Margaret Boden's book *Artificial Intelligence and Natural Man*, which explains the philosophical and psychological reasoning behind several of the best problem-solving programs.

Methods

The most common method, as previously stated, is by analogy with other problems which have already been solved. It can be used at several different levels in problem-solving, from the most trivial parts of a problem to the whole thing. Obviously, the more similarities found between problems, the easier it is to find analogous solutions. Other methods are summarised below.

— Decompose the problem into smaller problems and repeat the process until a stage is reached where the smaller problems can be solved. Recombine the pieces until the whole solved problem has come together.

— Generalise from a particular solution to cover a range of similar solutions. This includes techniques such as mathematical induction.

— Work backwards from the solution instead of forward from the problem. Both these methods could be used together until they meet somewhere in the middle.

— Criticise what has been done so far, in order to improve it and come closer to a correct solution, or to correct the mistake(s) in an incorrect one.

— Vary the problem slightly to see if you can find a solution to a slightly different problem more easily.

— Try out tentative solutions which are not intended to work but may provide valuable information about the problem.

— Try to find order in the data or facts that are known, so that further information about the problem can be gathered.

— Restate the problem in other terms, perhaps by starting with a different part of it, or by using other representations.

— Determination and drive to solve the problem. Although this is a human attribute, it equates with thoroughness and so can be translated to a computer by trying every conceivable possibility.

— Solve the problem by stages, each of which approaches the desired solution.

— Heuristic reasoning: find a solution that works for this problem but not one that is guaranteed to work for all similar problems.

'Computer problem-solving is still in its infancy but has made great strides forward. Current research seems to be using the psychological approach . . .'

— Make use of everything you know about the problem, however trivial.

— Bright ideas: these are only a possibility for humans and it is debatable whether a computer will ever have them.

All the above methods are used by people to solve problems and there are still other possibilities. A thorough discussion of mathematical problem-solving methods is given in Polya's book, and these methods can often be generalised for non-mathematical problems.

Computer aspects

As computers need to be well programmed before they can execute a task, they need to have background information to a problem expressed exactly and symbolically in an understandable form.

An example is getting a computer to play chess correctly. Consider the information that the computer requires. Firstly, it needs to know that chess is played on an eight by eight board — this could be represented in memory by the obvious means of a two-dimensional array. Secondly, it needs to know that there are two sides (players if you like), who each have 16 men of six different types divided into eight pawns, two rooks, two knights, two bishops, a queen and a king. These can be represented as different values in the array. One arrangement is to have empty spaces represented by zeros and one side's pieces as positive numbers, the other's as negative. The starting position is then represented by an 8×8 array with the various pieces placed correctly. Now the computer needs to know how to move legally. Give it a list of all the legal moves for each piece in turn. An example of such a rule would be: a queen may move any number of squares in a horizontal, vertical or diagonal direction as far as the edge of the board or the nearest other piece. This then has to be qualified by explaining capture of opponent's pieces. Similar rules have to be made for all the other pieces and for special moves such as a pawn's first move, castling and capturing *en passant*. Other rules of the game must then be added separately, such as taking it in turns to make a move, white moves first, the rules for winning or drawing, and the opportunity for draw offers or resignations to be made. A legal game can now be played by the computer by getting it to look at its list of legal moves and choosing one that can be made from the current position which doesn't result in an illegal position (moving the king into check, and so on). This procedure won't win any games of chess, however. It hasn't yet been told that it is supposed to try to win, or how to go about doing so.

The symbolic description of any problem can be regarded as a set of states of various variables with defined rules for moving between the states. The problem then becomes how to reach a particular final state from an initial state using the given rules. Any problem that can be described completely can be modelled by a system of variables with every possible position regarded as a state.

Of course, some problems can't easily be stated formally. Many philosophical problems could not be solved by a computer because there would be no way of *expressing* the problem. Imagine asking a computer to prove its own existence. It could only find the problem meaningless or never have enough information to be able to consider it.

When the problem has been carefully specified, solving it then becomes a matter of searching through all the states to find a path from the state representing the initial position of the problem to one corresponding to a solution. An exhaustive search through these possibilities might come up with a solution, but also might not; it is possible to get sidetracked on an infinitely long path which doesn't lead to an answer. Even if an answer can be found by a complete search, it will take so long that it will be of no practical use.

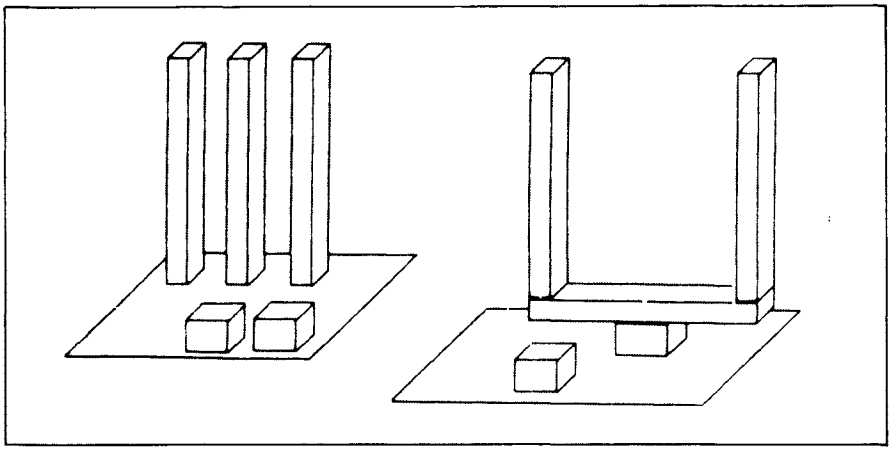

Fig 1 Build the second set-up from the blocks in the first

An example of this is the travelling salesman problem. In this, a salesman has a list of cities he must visit once. He can travel directly from one city to any other city. The salesman wants to work out the shortest route which takes him to each city once and returns him to his starting point. If there are N cities for the salesman to visit, and he looks at every possible combination of routes to find the shortest, then he has to examine (N-1)! combinations. If this is eight cities, then he has to look at 40,320 possibilities. Obviously a real salesman is not going to do this, but will look at the distances involved and pick a route that seems quite short. It won't matter that it isn't the shortest possible route, as long as it is one of the shortest. For a computer to solve problems of this type, it needs to have some type of strategy to limit the number of possibilities it has to examine. This may or may not mean that the best possible solution will have to be abandoned.

Strategy

When the symbolic representation of the problem is inside the computer, a strategy for solving it must be chosen. In a truly intelligent problem-solving program, the computer would choose this for itself as well as create the internal representation for itself. Less intelligent problem-solvers would have to be told of one or more methods within the program.

The choice of strategies to use in solving a problem depends on the way the problem has been represented. Some methods will be inapplicable due to the nature of the problem. A problem-solving method needs to do several things: it needs to be able to cause a change in the problem and the change needs to move towards a solution. It should be systematic so that it will eventually find a solution, if one exists. This usually involves searching or sorting through possible situations or states. It also depends on what type of solution is wanted and how long it will take to find.

Usually a very good solution is required quite quickly, if not the best solution. This involves finding a method that is more efficient than others and dramatically more efficient than a brute-force search (trying all the possibilities). Some of the things that should be looked at are whether the problem can be decomposed into subproblems; whether you can backtrack if something goes wrong; whether you can predict what may happen when trying out a possibility; whether a solution needs to be compared with other solutions to see if it is a good one; whether the facts about the problem are contradictory; whether everything is relevant to solving all parts of the problem; and whether a person is needed to help solve the problem. The major hurdle in computer problem-solving is good ideas; a computer can't have any. It must either be given one method to solve problems or choose between several methods.

Usually, problem-solving methods involve searching through the sets of states/possibilities by following the allowed rules. This involves traversing a structure like a tree or a directed graph (see Fig 3). When a search of a tree or directed graph is made, several factors have to be considered: the direction in which the search is to be made; how to proceed when branches occur in the path being followed; how to represent the different stages of the search since some record must be kept; how to select the rule to apply next; and the function or heuristic guiding the search.

Searching forward from the start or initial state of the problem is the obvious way to proceed, but there may be advantages to searching backward from the goal state or solution. It may also be a good idea to proceed in both directions at once and try to find common ground somewhere in the middle. The choice of how to follow branches in the structure depends on what type of structure it is and on the problem-solving method chosen.

Representing the stages of finding a solution can be simple or complex. Some problems involve facts that change as progress towards a solution is made. Usually the representations needed involve describing the individual facts about the problem and how these are combined to represent the current state of the problem. Then all these states need to be represented as they are passed through in the search for a solution. This must be done with care since records like these take up large amounts of space, especially where there are several combinations.

Selecting applicable rules to try on the current state of a problem is easy. All you have to do is look at the current situation and look along the list of rules until one is found that can legally be applied to the situation. Most situations will have several rules which *could* be applied: the problem is to select which ones *should* be. This involves looking to see what the rule will produce and then trying the rule that produces the best results, and this is where most problem-solving techniques come in.

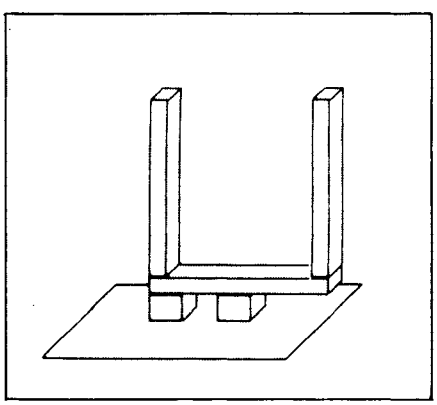

Fig 2 The desired result

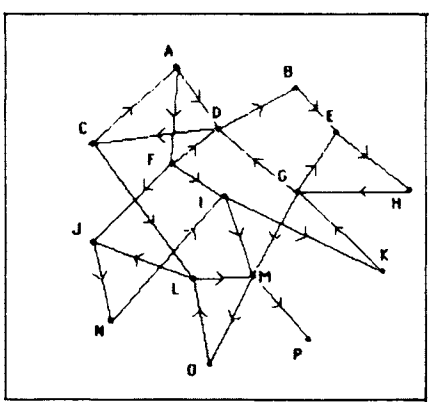

Fig 3 Structure

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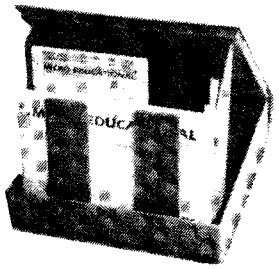

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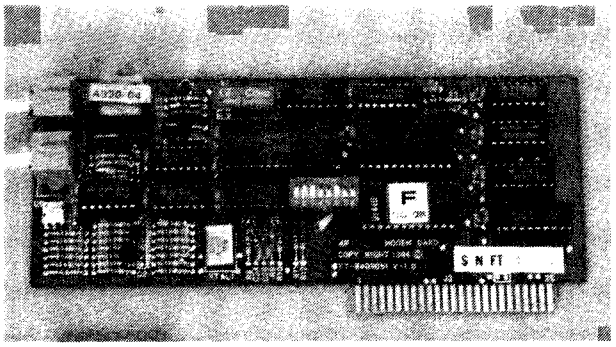

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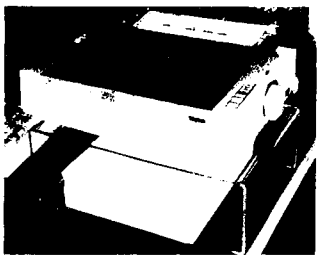

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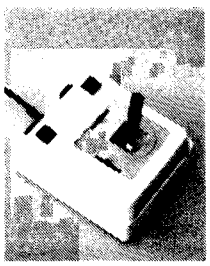

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Searching

There are two basic approaches to searching; these are the breadth-first and depth-first searches. The first corresponds to looking at all the possibilities quickly and then choosing from them. The second is like picking one possibility and checking it thoroughly before proceeding onto the next. They are usually applied to tree structures, but the general idea can be applied to other structures such as directed graphs. Detailed descriptions of many different searching algorithms and techniques can be found in computer science and artificial intelligence textbooks, but they are generally computer implementations of the most sensible and general methods used by people to search through these structures.

When a heuristic has been selected and used, the result should be checked for accuracy. Several programs can do this themselves and try a different method if the one tried isn't good enough. The program NOAH (Nets Of Action Hierarchies) by ED Sacerdoti has critic routines within it that keep an eye on the process of solving a problem as it goes on, and adjust it to improve its performance. They could be regarded as debugging the program while it is in operation.

It is difficult to find an example of a problem-solving program which is complex enough to solve a mildly difficult problem, but easy enough to understand quickly. One type of problem that is fairly common and has practical applications is how to move objects around when there are limitations on what can be moved with what, and the number of objects that can be moved.

The exact set of situations we want the program to solve are as follows:

There are up to M different types of object and up to N different objects of each type that could be carried between three locations — 1, 2 and 3. There is a rule forbidding certain combinations of objects to be together at the same time.

This program would be able to solve fairly simple questions such as how a robot can move a few objects between different locations. It would also be able to solve the celebrated missionary-and-cannibals problem. In fact, the program as given owes much to the program to solve the missionary-and-cannibals problem given in *Artificial Intelligence: An Introductory Course*, edited by A Bundy.

The missionary-and-cannibals problem is essentially as follows: there are a number of missionaries and a number of cannibals on one side of a river. They all want to get to the other side and can use a boat to do so. The boat can hold up to two people. There is one problem: if there are ever more cannibals than missionaries in one particular spot, the cannibals will eat the missionaries. How can they all get across safely? Usually there are an equal number of cannibals and missionaries to start with. Since this is a more complicated problem with rules involving how many things can move at once and how many can be together at one time, it is sensible to test the program.

Example problem

The program listing is given here together with the input and output for the problem with two missionaries and two cannibals.

Firstly, the rule is entered. It may look rather cryptic, but it makes use of the ability in DR Logo (the form of Logo used to write the program) to execute lists as if

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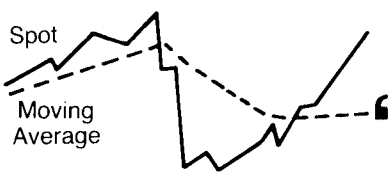

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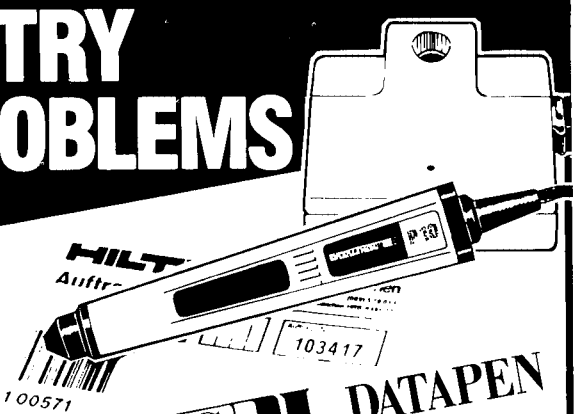

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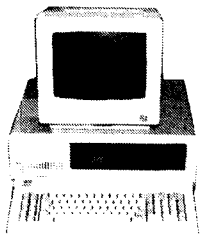

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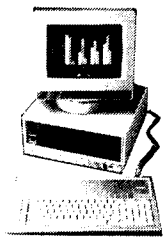

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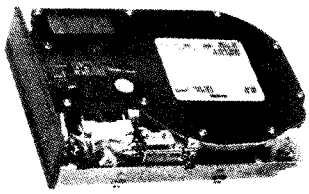

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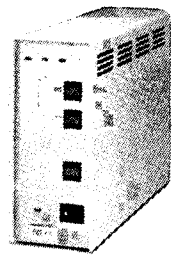

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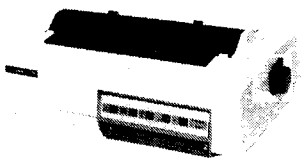

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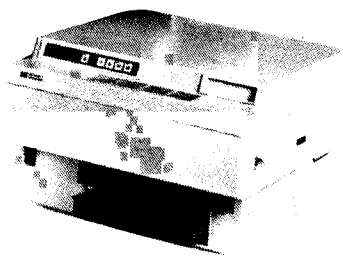

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they were program segments. The rule makes use of an additional procedure NUMBERAT which outputs the number of a given type of object present at a given location. It uses the procedure COUNTUP which calls itself recursively to count the number of objects at the location.

The initial and final positions are then entered as lists of objects, each list corresponding to a location. The same is then done for the desired final location. Then the list of legal moves is entered, each move as a list consisting of a list of objects to be moved and the location to move from and to. This part could be done by the program itself if it knew a few more details such as different block types, minimum and maximum numbers to carry, and so on, but this was not possible as it would have taken up an inordinate amount of space and time.

Then the other variables used are initialised and the procedure TRYMOVES is called with the list of legal moves. TRYMOVES tries out all the possible moves passed to it until either there are none left and it has failed, or until it succeeds in reaching the final position. Moves are tested using the procedure CHECK which takes the current position and the move passed to it by TRYMOVES. It checks that the move is a legal one and then tries it out by calling PERFORMMOVE. If this position contravenes the rule given, then it backs up to the old position and drops back out to TRYMOVE. Otherwise, if it has seen the position before, it also backs up; if it has finished, it notifies TRYMOVES that it is done. Finally, if it is a new position that is legal, it prints it out, adds the position to those it has seen before and, then, has TRYMOVES check from that position with all the possible moves.

TRYMOVES and CHECK work recursively, making a move and then trying out all the legal moves again from the new position. If all possible moves fail in any situation, then these procedures drop back to the previous level and pick up from where they left off.

PERFORMMOVE simply does what it suggests; it takes what should be moved from the move to make, and removes them from the location to move from using the REMOVE and REMNEXT procedures. It then adds them to the location to move to. APPLICABLE checks that a move can be made by checking that the objects to be moved exist at the location from which they are to be moved. Both REMOVE and APPLICABLE are made recursive by using REMNEXT and APPNEXT. The only other procedure is BACKUP which reverses the locations for the current move and then performs it with PERFORMMOVE, taking back the last move.

There are two things in this program that are not necessarily available on other versions of Logo. The SORT command, used in PROBLEMSOLVE and PERFORMMOVE, is not part of many Logos and may have to be written. It sorts the contents of a list and outputs the sorted version of the input list. Also, not all versions of Logo are able to execute a list. To get around this, some reprogramming would be needed to allow for different conditions about objects.

In this case, the rule says that there should not be more cannibals than missionaries (C and M respectively) at either location 1 or 2, except when there are no missionaries. The rest of the output from the program is self-explanatory, except that the message Backing Up... is printed whenever TRYMOVES drops back a level. It can be seen as rejecting the last printed move.

The program works simply by a brute force method — a depth-first search. It generates a tree of moves, searching down the right-hand branch first, as the moves are generated, and backing up as it finds that moves are impossible or do not work out. This program could be adapted to perform a more complex and intelligent search algorithm.

The future

Computer problem-solving is still in its infancy but has, nevertheless, made great strides forward. Current research seems to be using the psychological approach, and is looking more at *how people solve* problems than how people think *computers could solve* problems. Since computers obviously have a long way to go in imitating human ingenuity and creativity when solving problems, this is probably the best approach.

At present the only problem-solving programs commercially available are expert systems. Many of these are extremely good and are able to wade through mountains of specialist data to reach correct conclusions, but they still need to be told *how* to solve the problem. My opinion is that little more than this will ever be possible, despite increases in what computers *know* and *retain*.

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Peter Tootill explains the rudiments of computer communications.

Let's assume that you have obtained a modem and 'terminal software'. The latter is what turns your micro into a computer terminal, taking your keystrokes and sending them to the modem for onward transmission to the distant computer that you are communicating with. It also takes the incoming characters and displays them on your micro's screen.

The first hurdle in getting your micro online is connecting it to the modem. The easiest way around this is to make sure that you are given a connecting cable for your computer with the modem when you buy it. Different micros have different connectors on their modem ports (usually called RS232, or serial ports), If you tell the supplier what type of micro you have, he should be able to provide the right cable. Don't forget that some micros need an additional card, or other interface, before they can be used with a modem. IBM PCs, Commodore 64s and Spectrums are all examples of micros which don't have an RS232 port as standard.

For your first sessions online, you won't need a sophisticated terminal package; in fact, the simpler the better — a 'dumb' terminal program is perfectly adequate. If the software allows, set the RS232 parameters, then choose 8-bit word length — no parity, one stop bit. Then select the baud rate appropriate to the system you have chosen for your first call — probably 300 bits/sec.

Having bought the right connectors, connected your micro to the modem and loaded your terminal software, you are ready to go. It's a good idea to check that all is well by switching the modem to its Test mode, if it has one. In this mode, it echoes back to your computer everything received from it (the manual will show you how to do this). If what you type on your keyboard in this mode appears on the screen, then all should be working properly.

If all is well you can now choose a system to call, but there are a few points to watch here. Firstly, make sure that the system you call is compatible with your modem and software. V21 (300/300 bits/sec) systems are the most common, and most modems will work with these. Next, pick a few numbers from our lists, and make sure that they are running at the time you want to call. (Please don't call a part-time system outside system hours: it leads to a lot of aggravation for the people who run it.) Bulletin boards are good systems to start with as they are designed to make it as easy as possible for first-time callers.

The next thing is to set your modem to 'Originate' mode (you are originating the call) and to the right speed (V21 for a 300-baud BBS). Now dial the number of the chosen system.

When the system answers, you should hear a high-pitched tone from its modem. At this point, switch your modem online (or put the handset in it, if you are using an acoustic type). The carrier light on the modem, if it has one, should light up, and you should see a welcoming message appear on your screen. If all you see is garbage, the most likely reason is that your word length and parity are different from the system you have called (most systems work with 8-bit words and no parity, but if you have problems, you could try seven bits and even parity). If nothing happens, try pressing Return a few times. If the carrier light still doesn't light up you probably have the wrong modem setting for the system you are calling. V23 systems won't respond to V21 modems, for example.

When you make contact with a system, the first thing it will do is ask for your name. A BBS will then check to see if it recognises you from a previous call. If not, it will need to know certain things about the computer you are using to call it, in order that it can talk to you in the most convenient way, so it will ask you questions: one will probably be about the screen width you are using, which is simple; the others will be about 'nulls' (one-character pauses) and 'line-feeds'. The nulls question is to find out if your terminal needs a pause at the end of each line. It mostly applies to printer-type terminals, and is necessary to allow the print-head time to go to the start of the next line, before any more data is transmitted. It is usually safe to answer '0' to the 'How many nulls?' question, and if you want to play safe, you could ask for, say, five nulls.

The line-feed question arises because some computers automatically start a new line after a carriage return; but with others, the cursor just goes to the start of the line it is on, and needs a line-feed as well to make it start a new line. If you are not sure, say yes; if that's wrong, lines will be double-spaced on your screen. Better that than being wrong the other way and having everything that is sent to you appearing on one line, which can be very difficult to follow! Some BBSs have a standard list of computers to choose from, and if yours is included you won't be asked these questions, which makes life easier. If you give the wrong answers, there is usually a command on the system to allow you to change things later.

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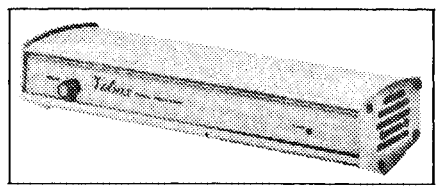

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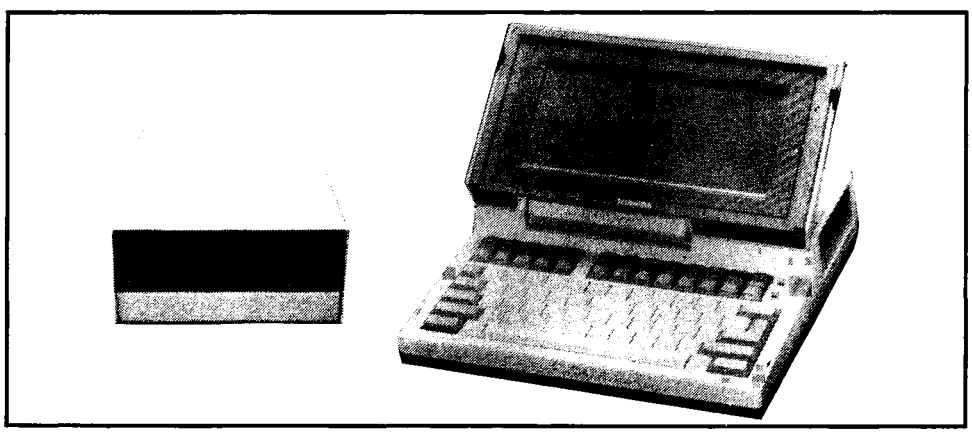

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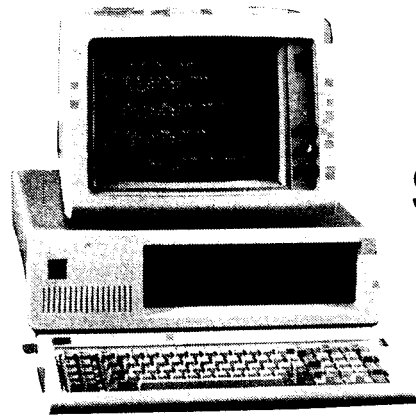

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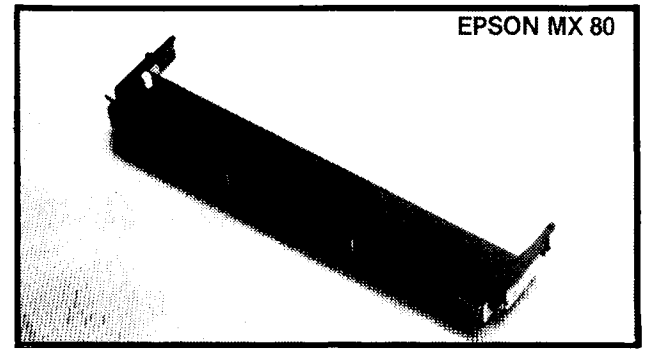

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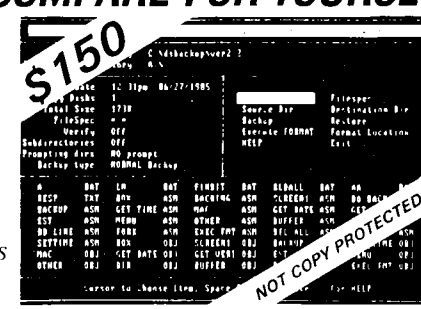

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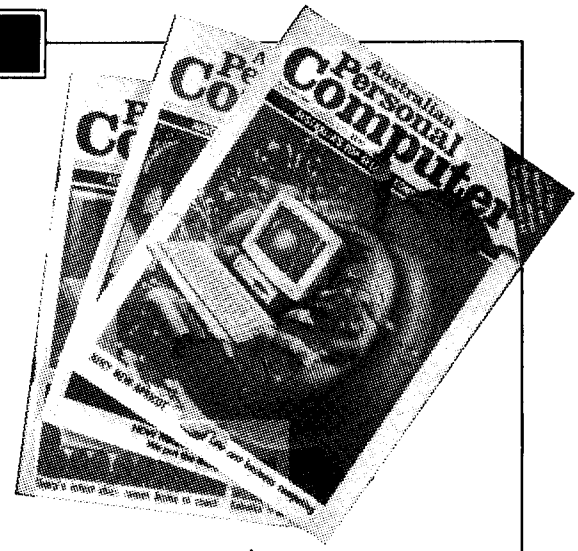

This Back Issues listing has been updated to include all of the available 1985 issues of APC. A postage-paid order form is between pages 64 and 65. Please allow up to four weeks for delivery. Note that a number of previously unavailable issues have been uncovered from APC's archives and are indicated by a '●'.

● Volume 1 No 4, 1980
Benchtests: Hewlett Packard's HP85, Texas Instruments TI 99/4/Gateways to Logic Part 1: Teaching others about micros/Face to Face, Part 1: Life at the Man/machine interface/Adding a different family of chip to your micro/Random numbers — and how to generate them/Computer Games, Part 4: David Levid on speeding up tree searching/Book review: Alvin Toffler's "The Third Wave"/The Complete Pascal, Part 4: Data types, arrays and sets/Programs: 3D Noughts and Crosses (TRS-80), PET Backgammon.

● Volume 1 No 6, 1980
Benchtests: Commodore 8032, SuperBrain/Overview of chess machines and micro programs/Writing machine independent Basic programs/Printer review/Programs: Lunar Lander (TRS-80), PET Fighter Pilot, Apple Plotting, LPrint to Print utility (TRS-80), ZX80 Breakout, Graph (TRS-80).

● Volume 1 No 7, 1980
Checkout: Super 80 hi-res board/Robotics discussed/Three micro tournaments reviewed/Computer Games: "Guessing the odds" in game programming/APC-80: First ever instalment/The Complete Pascal, Part 6: Records and Files/Speeding up TRS-80 pocket computer programs/Free format dialogues at the man-machine interface/Programs: TRS-80 Tarot, PET Bloobers, PEEK and POKE for Apple Pascal, PET Demolition, Superboard Bug Bypass, String Function (Microsoft Basic), Several Sorts (Microsoft Basic).

● Volume 1 No 9, 1981
Checkout: "The Last One" program generator/Multi-User Systems, Part 1: Introduction/Computer Games: Bluffing and psychology/Disks and disk drives explained/Recovering from a data tape disaster/Developing a business program, Part 1/APC-80: String execution and blockmoves/Introduction to machine language/Gateways to Logic, Part 4: Binary arithmetic/Ultrafast tape storage for the Superboard/The Complete Pascal, Part 8: "Top-down" design of large scale text formatting programs/Review of The Forth language/Programs: TRS-80 Target Practice, TRS-80 Four in a Row, PET Anagram, PET Obstacle Course, Minefield (TRS-80).

Volume 2 No 3, 1981
Checkout: Sinclair ZX81/APC-80: Recovering lost programs. JUMP command (allows a GOTO "numeric expression")/Building a Bigboard/Keystroke reduction for EDTASM users/Sanders Printer reviewed/Profile of BS Microcomp/CP/M explained by Rodnay Zaks/The rapid bubble sort for the Apple/Encryption for any Microsoft Basic/An imagined 6502 "Dream Machine" specs/Vectors explained on the Challenger IP/Programs: TRS-80 flashing cursor and non-destructive backspace, Treasure Hunt (PET).

● Volume 2 No 5, 1981
Benchtest: IBM Personal Computer, NEC PC8000/WP Benchtest: Spellbinder/Gate array design and firmware modules: an upcoming generation of chips/Winchester hard disks explained by Rodnay Zaks/Computer Games: Poker on micros/Gateways to Logic, Part 9 (end): Typical teaching projects/Artificial Intelligence/How Computers Communicate, Part 2: The I/O Bus/Storing alpha-numeric records under CP/M/Part 2 of 2: Defining program specification needs/Apple "booby trap" documented/Make PET disassembled programs more readable/Explaining the WAIT function for OSI and PET machines/Putting a bell tone onto the Superboard/Programs: TRS-80 Sailing Simulation, ZX80 Eldorado, PET Gomoku.

● Volume 3 No 1 1982
Benchtest: Tandy TRS-80 Color/Checkouts: Hitachi Peach, Sharp's Microtranslator, BBC Proton/Profile of Rodnay Zaks/Sorting alphanumeric codes from disk to disk/Computer Games: GO-MOKU on micros/Generating Patterns with a computer/How Computers Communicate, Part 3: The parallel interface/Review of Forth Language/A neat way to describe programs quickly and logically/Speech Synthesis for the TRS-80s, System 80s, Part 1/Cassette utility for System 80 on Eprom/An easy route to shape tables for the Apple/Rubic Cube Simulation for the Apple/How to implement "Turtle" graphics on an Apple/Programs: Get Simulation (Apple), Bug Bug (TRS-80), Cryptography (Microsoft Basic).

Volume 3 No 2, 1982
Checkout: Apple III/Fitting a smooth curve to complex data plots/Speech synthesis for TRS-80s, System 80s, Part 2/"Bridge" on micros/ Relocating assembly language programs/Binary sort explained/Programmable rhythm generator project for PET/Large number calculations on micros/Basic interpreters explained/Checkout: ZX81 printer/APC-80 overview and debounce routine/Storing arrays on tape/Frames of Reference, Part 1: A DP manager's guide to micros/How Computers Communicate. Part 4: The IEEE interface/Overview of micro-computer databases/Programs: TRS-80 Alien Seabattle.

Volume 3 No 4, 1982
Benchtests: Osborne 01, Micro-Bee/APC-80: Command mode syntax error recovery/How Computers Communicate Part 6: The RS232 interface/80 x 24 display controller project/Preview of the Commodore 64/Atari 400 games reviewed/Profile: Adam Osborne/ANS Basic's features/Solving the hidden surface problem in 3D graphics/Frames of Reference. Part 3: Micros in mainframe company/Hewellt Packard's networking capability/Programs: TRS-80 Reaction Timing, ZX81 Graphplot, PET Cheese, Superboard Spin-Fighter, TRS-80 Extra.

Volume 3 No 5, 1982
Benchtests: Texas Instruments TI 99/4A, Xerox 820/Database Benchtest: FMS-80/TRS-80 Model 1 games reviewed/Frames of Reference, Part 4: Software standards/How Computers Communicate, Part 7: Interrupts in micro systems/How to use 3D graphics/Equation solving program/80 x 24 display controller project, Part 2/"Logo" Overview/Printer survey/Casio's calculator printer/Programs: TRS-80 Double Precision Maths and Trig, Apple 3D Maze, Atari Sums for Kids, Apple Air Flight.

Volume 3 No 6, 1982
Benchtests: Sinclair ZX Spectrum, Sirius I/Database Benchtest: dBase II/7th West Coast (micro-computer Faire)/ Checkout: F-10 Daisywheel printer, Arfon Expandaboard/How Computers Communicate, Part 8: Direct memory access/Frames of Reference, Part 5: Buying micro hardware in a DP department/Self learning program/80 x 24 display controller project, Part 3 (end)/How to get more on Apple disks/Lisp — an artificial intelligence language/VIC-20 games reviewed/Implementing CP/M system calls from Microsoft Basic/APC Subset (first on new monthly column for assembler language routines)/Programs: TRS-80 Invader, PET Mini-animate, VIC-20 Trailbalzer, ZX81 Book Index, Weebug Monitor (TRS-80), VIC-20 Large Characters.

Volume 3 No 7, 1982
Benchtests: Sharp MZ80B, Monroe OC 8820/Checkout: Sharp PC1500, The Micro-Professor/Apple II games reviewed/APC-80: Various PEEK and POKEs explained/Reversing images on computer screens/Frames of Reference, Part 6: Putting your micro to work/How Computers Communicate, Part 9: Character codes/Educational arcade-type game/Programs: ZX81 Hypocycloids, TRS-80 Truth, PET Doc, TRS-80 Screen Dump, PET Boxes, Atari Earth.

● Volume 3 No 8, 1982
Benchtest: Sord M23/Checkout: TI-83, Sony SMC-70/NCC Show Report/Sirius Graphics/Advanced graphics techniques/UCSD p-System overview, Part 1/IBM PC users talk/Taxonomic classification on an Apple/How Computers Communicate, Part 10: The software of I/O/Abbreviated execution version of APC-80/RS232 overview, Part 1/Checkout: Apple II Screenwriter/Programs: TRS-80 Quadrangle, PET Mopup, Randomization Tests (ZX81).

Volume 3, No 9, 1982
Bechtest: ICL Personal Computer/Checkout: E40(CP/M data compression utility) Daisywriter printer, HP IIC & 120 calculators/BBC micro graphics capability/Best of APC's cartoons/How to use Benchmarks/Logo Program (Microsoft Basic) Computer generated textures/RS232 overview, Part 2/Memory-saving utility for Apple/How Computers Communicate. Part II: Interrupts and buffers/Programs: System 80 Extended Basic, Apple Trees, ZX81 Alphabetising, PET File Companion, PET German Game.

Volume 3 No 10, 1982
Benchtests: Hewlett Packard HP-86, National Panasonic JB3000/Checkout: Sharp PC-1211/UCSD p-System overview, Part 3 (end)/How to implement 3D graphics on a micro/CP/M-86 vs MS-DOS: Relative merits of these 16-bit operating systems discussed/Designing your own database/Monitor for TRS-80/System 80/File searching method/"Laws of Form" — a novel form of logic/How Computers Communicate, Part 12 (end)/Benchmarking high level languages/Programs: TRS-80 Cardshuffler, PET Knockout, PET Trains.

Volume 3 No 11, 1982
Benchtests: Hewlett Packard HP75C, Kaypro II, DEC Rainbow/Programs for the HP41C and Casio fx702p/Algebra checking program/More on MS-DOS vs CP/M-86/Predictions in the micro industry/Clock/calendar card for the Apple II. Part 1/Benchmarks summary/Programs: Apple II Piano Computer, Moon Module (Apple II, correction in Vol 4 No 1), Walls (Atari, correction in Vol 3 No 12).

● Volume 4 No 1, 1983
Benchtests: Jupiter Ace/NEC/APC Manhunt competition/Tokyo Data Show/"Forth" Benchmarks/The perils of micro-addiction/Charles Babbage, the man who almost invented the first computer/'Expert Systems' — advice and intelligible explanation of its decisions/Warnier-Orr: Program design technique/Programs: PET Search and Rescue, VIC Connect-4, Atari Character Set Mover.

Volume 4 No 2, 1983
Benchtests: Sharp PC1251/Database Benchtest: Hi Data/Micros as best friends/A major boost to the standards of 'user friendliness'/Computing can be a health hazard/'Expert Systems' — part two: appraisal of 'intelligent' computers/Networks: Part 1/The Logo Turtle checked-out/Getting the most from the BBC's graphics/Are home computers just a passing fad?/The Prestige vs The human: micro chess/Programs: Apple Character Plotter, System Tape Copier (TRS-80/System 80).

● Volume 4 No 3, 1983
Benchtest: Corvus Concept, IBM 9000/Checkout? IBM PC vs Columbia MPC, IBM PC vs Hitachi Success/Visi-On and Apple's Lisa compared/Visi-On: Visicorp's new general purpose program/CP/M '83: The first software product exhibition/Transforming unused RAM into pseudo disk drives/Pascal Benchmarks/Eprom/RAM board for the TRS-80/System 80/Direct graphics entry for the TRS-80/System 80/Networks: Part 2/ The Consumer Electronics Show review in Las Vegas/Portable Computer World: Hexadecimal madness/Programs: Atari Animation.

● Volume 4 No 4, 1983
Benchtest: Dick Smith VZ-200/

BACK ISSUES

Spread Sheet evaluations: Part 1/Checkout: 1st APC Show/A look at 'C'/Networks: Part 3/ Building your family tree on a micro/Low-cost System 80 memory expansion/Micro users get the upper hand/Pascal Benchmarks explained/How dentists can use micros/Programs: PET Billy (correction in Vol 4 No 6 Bludners), ZX81 Molecular Weight, Adventure in 1k, TRS-80 Word Scrambler.

● Volume 4 No 5, 1983
Benchtests: NEC Advanced Personal Computer, Commodore 64/Which Spreadsheet: Microsoft's Multiplan/Casio PB100 hand-held micro reviewed/ Screen-play: VIC-20 games under the spotlight/A visit to the Hanover computer faire/Checkout: Microsoft MS-DOS2/ Reliable Code: Programming tips/An introduction to the artificial intelligence program, LISP/Linking up a System 80 to a Tandy Lineprinter/Programs: Bricklayer (CBM 4032), Escape Maze (Atari 400/800).

● Volume 4 No 6, 1983
Benchtest: Texas Instruments' Professional/Checkouts: Comx 35 home computer, NEC's Spinwriter daisywheel printer/ Multi-Tool Word wordprocessor from Microsoft/Occam Occult: futuristic new language/The world of creative cross-figures/ MicroBee games reviewed/Are micros a good idea?/Programs: Construction Worker (System 80, TRS-800, Chicken Little (MicroBee), PET Zombies, Spectrum Blaster, Commodore 64 Sprite editor.

Volume 4 No 8, 1983
Benchtests: Apple Lisa, DOT/ Checkouts: Osborne Executive, Epson FX-80 printer/Consumer Electronics Show Report/Will the Computer be the next dominant species on Earth/ Milton Bradley's chess computer that moves its own pieces/ Choosing suitable disks for your computer/Cryptography on a micro/Warnier Orr structured programming, Part 1/How to use the six function keys on the PC1500/Programs: ZX81 Least Squares. System 80 Loading tapes from an external cassette player, TRS-80/System 80 Adventure program, Apple II Pascal menu generation.

Volume 4 No 9, 1983
Benchtests: Sord M5/Checkout: Tandy Model 100, Lisawrite/ Screenplay: TI 99/4A games/ Steve Wozniak returns to Apple/ Choosing a home micro/Warnier Orr programming, Part 2/Graph plotting and curve fitting on the BBC Computer/Bemoaning the mechanical teller/Programs: VIC-20 Snake line, ZX81 Surround, Apple II Screenplay, PET Histogram.

Volume 4 No 10, 1983
Benchtests: Archives PC/Home Computer Survey — 15 micros selling for less than $1000 checked out by Steve Withers in an exhaustive market survey/ Checkout: Simons Basic, T/ Maker III — office tool for the IBM PC, Digital Research Personal Basic/Computerising Your Business — a light and practical guide/Beginners Guide to Basic Program Conversion/ Clever trick with TI Sprites/ Cocktail program/Warnier Orr programming, Part III/How portable is portable/Programs: Atari No-Trons, TRS-80/System 80 Multi-Maths, Apple Text Maker, VIC 20 Spider.

Volume 4 No 11, 1983
Benchtest: Apricot/Checkouts: Atari 600XL, Ashton Tate's Financial Planner, Condor database, Atari Writer/Which Spreadsheet? PerfectCalc/ Profiles: Clive Sinclair, Nolan Bushnell/Set up your own computer learning centre/Basic Converter Chart/Warnier Orr Programming Part 4: Techniques (end)/Programs: PET Wave Simulation, Apple II Aplist, Microsoft Basic Calendars, TI99/4A Breakout, Commodore Testing Your Fingers, Apple Dotter Puzzle, VIC-20 Starship, Commodore Maths Test.

Volume 4 No 12, 1983
Benchtest: TANDY MC-10/ Checkout: Executive 816, Lotus 1-2-3, VisiOn, Gemini 15X Printer/Computerising Your Business: Part 2, Setting up/ Sort Trees for beginners/Printing big on an Epson printer/Bulletin boards/Programs: VIC-20 Robotank, VZ-200 Missile Command, New 'Bee Screen. MicroBee Grooble Grab, Apple French Test Card, TRS-80 Road Rally.

Volume 5 No 1, 1984
Benchtest: NEC PC-8201A/ Checkouts: Coleco Adam, Kaypro 10, Atari Paint, Desq/Micro music — how it's done: Part 1/ "Check Digits" — methods of ensuring correct data entry/ Building models using surfaces, not lines/Column sort algorithm/ Graphics on Tandy's Co Co/ Spectrum listing: photofit/ Locking Apple Listings/Programs: Commodore 64 Fast Sprites, IBM PC Sheepdog Trials, VIC 20 Variable List/Spectrum Lower CLS, Commodore 64 Monitor, Oric City Defense, MicroBee Tunes.

Volume 5 No 2, 1984
Benchtest: Workslate, Commodore 720/Checkouts: Visuall, Sord's Falc, '64 Vizawrite, Brainstorm/DIY Apple Interface/ TRS-80 Disassembler/Benchmark summary to-date/Basic Program Conversion, Part 2 (Part 1 in Vol. 4 No 11)/BBC Music, Part 1/Could speech synthesisers do long term damage to the language?/Programs: TRS-80, Pascal Procedures, PET Maths Maze, BBC Logic Tree, VIC 20 Grid Bike, '64 Helibomber, '64 Battlestar Fighter, Apple Bridge Builder.

Volume 5 No 3, 1984
Benchtests: IBM PC Junior, Sharp MZ-700/Checkouts: Androbot's Topo, Homeword word processor, TK!Solver, Educational Games/Basic Program Conversion, Part 3: Apple II graphics/Atari memory (for patterns of colour and sound) tester/Teach Yourself Assembler. Part 1/BBC Music, Part 2/View of the future from the author of VisiCalc? Give your program cassettes a spoken index/Programs: Apple Stargo, PET Areas, Spectrum Jackpot, Atari Split-screen, TRS-80 Sound Synthesiser, 3D 'Bee, '64 Sprite Designer.

Volume 5 No 4, 1984
Benchtests: Macintosh, Spectravideo/Checkouts: IBM Portable PC, Unix, Visiword Plus, Spectravideo/Teach Yourself Assembler, Part 2/Basic Program Conversion, Part 4: TRS-80 and Apple II graphics/Sharp PC1500 game scoring listing/ Interview: Bill Gates of Microsoft/Microchess: 4th World Chess Championship results/ Inside Atari's research laboratry/ Programs: (Microsoft Basic) Inlay Cards, BBC Splash!, VIC 20 Invaders, Commodore 64 Reversi, VZ-200 Moon Lander, ('64) Gary the Guitar.

Volume 5 No 5, 1984
Benchtests: Hewlett Packard 150 Touch Screen, Dick Smith Challenger, Canon X-07/Checkouts: Revelation, Concurrent Cp/M, StarBurst and StarIndex, Sendata modem, Commodore SFD 1001 disk drive, Brother EP44 personal typewriter/Basic Program Conversion, Part 5: Atari/Compaction techniques, examples in Commodore Basic/ Teach Yourself Assembler, Part 3/Text vs Graphics adventures/ Operating Systems, Part 1/ Microchess: Superstar vs Constellation/Programs: '64 Plane Attack, Commodore Wordsquare, Atari Flash Simulator, Atari Pseudo-Dos, Sord M5 Charpatt, VIC 20 Ape King, MicroBee Hires Editor, Apple II Oisterads, 'Bee Label Printer.

Volume 5 No 6, 1984
Benchtest: Sharp PC5000/ Checkouts: Codewriter, Microsoft Word, Dick Smith Cat, Apple ProDos, Knowledgeman, Autocad/Play Battleships on two Commodore computers/The History of the Keyboard/Teach Yourself Assembler, Part 4/ Artificial Intelligence: a report from Japan/Basic Program Conversion, Part 6: Spectrum/ Spectrum "wide screen" word processing/Software Copyright: the debate/The dangers of reviewing software/Programs: TRS-80 Compiler, TRS-80 Braille Writer, VIC 20 Deathwall, Basic-86 Marvin, PET 3 D O's & X's, Five W 'Bee.

Volume 5 No 7, 1984
Benchtest: Epson PX-8/Checkouts: Memotech, Framework, HP Ink Jet Printer, Expert-Ease, Apple's Instant Artist/Teach Yourself Assembler, Part 5/ Operating Systems, Part 2/ Designing and selling programs, Part 1/Calling routines available in CP/M/The story behind MSX/Basic Program Conversion, Part 7: BBC/Programs: '64 Balloon, Atari Function Keys, BBC Sected, MicroBee Slalom, VZ-200 Blockout, '64 Split Screen Graphics, VIC 20 Monster Hunt.

Volume 5 No 9, 1984
Benchtests: Hewlett Packard 110/Checkouts: Framework vs Symphony, overview: Portable Computers, Jane vs Appleworks, Pick/Profile: Wayne Wilson/ Teach Yourself Lisp, Part 2/ Logic of assembly language, written in convertible Basic/ Teach Yourself Assembler, Part 7/Braindump: Defence of the Gotogoto Bird *(this is a really excellent one page article — Ed)*/Microchess: Cray Blitz vs David Levy/Programs: '64 Defuse, BBC Mindwaves, VIC 20 Gothic and Greek, '64 Brackets (an updated version appears on page 76 of Vol 5 No 11, 1984), Spectrum File, VIC Star Scramble (note: a correction to this program appears in the Bludners section of Vol 5 No 10, 1984).

Volume 5 No 10, 1984
Benchtests: Commodore Plus/4, Osborne Encore/Checkouts: Model 100 disk drive and video interface, Open Access, GSX from Digital Research, Netcomm modem/Is this education software any good: opinion/DIY robotics for the BBC/Combining video and PC output on the one screen/Sorting useful-sized files without a disk/Bubble memory: has it been worth the wait/ Teach Yourself Lisp, Part 3/ Pirate Bulletin Boards/DIY PC-video connection/How to write great software, Part 1/Programs: Atari Autorun, Commodore 64 Basic Assembler, Apple II Menu, BBC Equation Solver, Commodore Honeypot, Atari Snake, Spectrum Voyager, VZ-200 Mini calc Spreadsheet (improved in Bludners Vol 5 No 12, 1984), IBM PC Microcomputer Graphics. Animated '64 Spectrum Graphics and sound.

Volume 5 No 11, 1984
Benchtest: Apricot F1/Checkouts: Olivetti M24, Sperry PC, ITT Xtra, Commodore 16, AAP's microwave news service/The demise of the philosophy of the scholar: opinion/Artificial Intelligence: mind over matter/DIY Micro Music Circuit (to plug into a parallel port)/Computer Musicians/Teach Yourself Lisp, Part 4/Compilers: How they work and how to buy the best/ Improving Commodore 64 programming skills/How to write great software, Part 2/Molecular electronics/Programs: Commodore 64 Superfile, Commodore 64 Mouse Master, '64 Sprite Editor, BBC graphics compiler/ interpreter, Spectrum Crib Player, VZ-200 MON-200, Duelling VICs.

● Volume 5 No 12, 1984
Benchtests: IBM PC/AT, Sony MSX/Checkout: Digital Research GEM, TI Speech Command, dBase III, Sunol network (for IBM & Apple)/How to produce natural language interfacing/ Intro to the 68000 processor/ How to set-up a bulletin board/ Teach Yourself Lisp, Part 5/DIY Speech Synthesiser/How to write great software, Part III/ Converting VIC programs to the '64/Programs: Spectravideo Spectra-draw, Commodore 64 Hi-res Plot, TRS-80 Auto Cassette Index, Tandy Color Brimstone Part One, Spectrum Life, Dayfinder (written in Lisp), Commodore 64 Gremlin's Garden.

Volume 6 No 1, 1985
Benchtests: ComputerPhone, Data General One/Checkouts: Filevision, Juki 6100 printer/ Spreadsheet product overview/ Data validation in Microsoft Basic/Teach Yourself Lisp, Part 6/Voice synthesis and recognition as a viable alternative to the keyboard/Programs: Brimstone Part 2, Spectrum Golf, Basic Sort At Input, Commodore 64 Def-keys, Commodore 64 Space Drop, Commodore 64 Raster Interrupts, VZ-200 Sketcher.

● Volume 6 No 2, 1985
Benchtests: Sharp 5600, Apricot Portable, Sega SC3000H/Checkouts: Viewsheet, Koala Pad, Mission Impossible, Hitch-Hiker's Guide to the Galaxy/ Editing videotapes with a home computer/Teach Yourself C, Part 1/Useful Basic algorithms/ Benchmark comparisons/Programs: 64 Disk Manager, Atari Meteor Attack, Brimstone Part Three, BBC Draughts, TRS-80 Adventure Parsers, MTX Old, Commodore 64 Screendump.

Volume 6 No 3, 1985
Benchtests: North Star Dimension, Digital Research GEM/ Checkouts: Microsoft Macintosh Basic 2, WordStar 2000/ Preview of new Commodore and Atari machines/Moving up from dBase II to III/Teach Yourself C, Part 2/Data transmission methods/Random number and arithmetic algorithms/Computer controlled lasars/Cray Blitz at the North American Computer Chess Championship/Programs: Spectrum Qix, Atari Disk Sector Editor, BBC Basic Line Profiler, TI/99A Submarine Hunt, Crazy Caverns, Part 1 (Commodore 64).

dVolume 6 No 5, 1985
Benchtests: Commodore PC/ Checkouts: Yamaha CX5 MSX music micro, Enable, Smart, Seiko wristwatch micro, Sidekick, Spotlight, Omni-Reader/Do you need a multi-user system?/ On-line information services/ Lasar disks as computer memory/PC-Mainframe links, Part 1/Digital Research Concurrent DOS 286/Teach Yourself C, Part 4/APL computer language/fWorld Microcomputer Chess Championship/Programs: Split MicroBee, VIC-020 Programmable Keys, dBase II Preprocessor, BBC Screen Designer-Input Validation, VZ-200 Micro Type.

Volume 6 No. 6, 1985
Benchtests: Atari 520 ST, Texas Instruments Prolite/Checkouts: Brother WP600 printer, Amstrad Microscript, Digital Research Presentation Master, Microsoft Word for the Macintosh/ Keeping your PC running smoothly/PC-Mainframe links, Part 2/Musical possibilities with the MIDI interface/Turbo Pascal/Teach Yourself C, Part 5 (end)/Spreadsheet techniques/ Incorporating artificial intelligence into your programs/Data transmission by cellular radio/ The fate of Unix/CBBS (for bulletin boards) explained/ Programs: Commodore 64 Disk Utility, Spectrum Triplets, Atari Error Message Reporter, BBC Format 40/80, Atari Multi-Mode Text, Amstrad See PC, Tandy Color Darts.

Volume 6 No. 7, 1985
Benchtests: HP Integral PC, Commodore 128/Checkouts:

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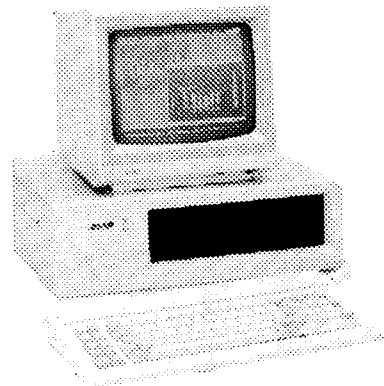

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ERA Encryption board, Microsoft File, Skai disk drive (for the Commodore 64), Hi-Tech C vs Aztec C/Speeding up a PC/Macroprogramming with Spellbinder/Random numbers and how to win at Blackjack/Computer incompatibility/Teach Yourself Logo, Part 1/Interfacing an Apple II with a BBC/PC-Mainframe links, Part 3 (end)/Viatel for the micro user/Edward de Bono on AI/Programs: Commodore 64 Logic Emulator, Spectrum Nine Men's Morris, Atari Yahtzee, BBC Alpha (AI simulator), Commodore 64 Disk Operations (routines for 1541 owners), Apple Turtle, VZ-200 Database.

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Volume 6 No. 12, 1985
Benchtests: Hewlett-Packard Vectra, Olivetti M24SP, Apricot F10, Amstrad PCW8256, Spectravideo X'Press/Checkouts: Apple Hard Disk 20, Homepak, Cornerstone/Reduced Instruction Set Computers/Pascal vs Basic vs Comal/Micro maintenance companies/Encryption of data: the state of the art/Parallel architectures/Teach Yourself Logo, Part 5 (concludes in Feb '86)/Copyright when the author's dead/Programs: Commodore 64 Trace-Walk-Step, Spectrum Spreadsheet, Amstrad Amsquill.

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Making a hash of it!

David Payne considers traditional hashing algorithms, using an extract from a telephone directory to present his case.

For those unfamiliar with the principles of hashing, here's a short introduction.

Where fairly large numbers of records are kept and required to be searched for information, some systems obtain every record sequentially, examine it for the requested content and take either bypass or display action. If the file holds 1000 records and only one of these contains the parameter searched for, then the system will waste 99.9 per cent of the search time looking at records which do not contain the detail requested. If we knew that the one record in question was at No 748, then we could go straight to it, the result being that the time taken in searching would be virtually eliminated; but *how* do we find where the record is stored?

This is where the principle of hashing comes in; essentially there is one field in the record, known as the key field, which is manipulated to produce a number, known as the hash, which in turn determines the position of that record in the file when it is first added. When this same key data is subsequently entered for search, it will be used in the same way and consequently produce the same hash and record number.

The majority of record files are alpha-based (usually surnames), and the traditional method of hashing is to take the ASCII values of selected character positions in the name and manipulate them arithmetically in order to produce a record number between one and the maximum that the file is designed to accommodate.

Disadvantages

It is considered by some that hashed files have two main disadvantages: firstly, that searching is confined to the key field only; and, secondly, that the method is wasteful of space on the storage medium due to the fact that the file contains nothing but empty records when it is originally created. In the first instance, a properly written system will offer not

Letter	Pages	Per cent
A	140	4.35
B	302	9.39
C	270	8.40
D	149	4.63
E	76	2.36
F	117	3.64
G	159	4.94
H	232	7.21
I	32	0.99
J	80	2.49
K	98	3.05
L	146	4.54
M	267	8.30
N	70	2.18
O	50	1.55
P	176	5.47
Q	8	0.25
R	153	4.76
S	299	9.30
T	125	3.89
U	14	0.44
V	30	0.93
W	200	6.22
X	1	0.03
Y	14	0.44
Z	8	0.25
	3216	100.00

Fig 1 A-Z breakdown from the telephone directory

Letter	Recs/1000	Start
A	44	1
B	94	45
C	84	139
D	46	223
E	24	269
F	36	293
G	49	329
H	72	378
I	10	450
J	25	460
K	30	485
L	45	515
M	83	560
N	22	643
O	16	665
P	55	681
Q	2	736
R	48	738
S	93	786
T	39	879
U	4	918
V	9	922
W	62	931
X	1	993
Y	4	994
Z	3	998
	1000	

Fig 2 A-Z breakdown for a 1000-record file

Combination	Entries	Records	Start
BA	25625	23	45
BB			45
BC			45
BD			45
BE	17000	15	68
BF			68
BG			68
BH	820	1	83
BI	5500	5	84
BJ	17	0	84
BK			84
BL	6000	6	89
BM			89
BN	7	0	89
BO	11500	10	95
BP			95
BQ			95
BR	22625	20	105
BS	3	0	105
BT			105
BU	13625	12	125
BV	1	0	125
BW			125
BX			125
BY	1125	1	137
BZ			137
	103848	93	

Fig 3 Proportional data for BA to BZ

only searches by key field, but also searches by key and one or more other fields in combination; the latter may be slower but it is still infinitely faster than normal sequential access. In the second instance, when we can store 5000 x 140 byte records on a floppy disk costing less than $10, this can hardly be considered wasteful.

Due to the purely numerical basis of traditional hashing algorithms, their main failing is that they allocate an equal amount of file space to each letter in the alphabet; in reality the alphabet does not work in this way, and in order to determine the true usage for surnames a large list was required for analysis. The most suitable and readily available list was found in a large telephone directory with a total of just over 3200 pages and containing some one and a quarter million entries. A breakdown of letter usage within the alphabet and the relative proportions are given in Fig 1. Some interesting facts will be observed from this table; for example, the first three letters use 22.14 per cent of the alphabet: the largest six total 48.82 per cent. If the 'equal share' algorithm were used, then the largest, B(302), and the smallest, X(1), would be allowed a share of 123 pages each in the directories; this system, of course, would very soon end in a screaming foul-up.

Example

For the purposes of this article we will deal always with a file of 1000 records; all figures and algorithms quoted can, therefore, be easily adapted for files of differing sizes by the application of a suitable adjuster. The proportion of 1000 records and the start number for each letter of the alphabet are given in Fig 2. If we apply the equal share principle, then the letters B(94) and X(1) would be allocated 38 each; so how can we use the data to produce a proportional hashing algorithm?

The A-Z proportions and the start numbers as shown in Fig 2 need to be available to the algorithm, and as these are finite, the most suitable way of dealing with this in Basic is from two arrays read in from data statements (note that these numbers are slightly adjusted):

```
DIM ALPH(26) — Proportion of 1000
  for each letter
DATA 44,93,83,46,24,36,48,71,10,
  25,30,45,82
DATA 22,16,55,4,48,92,39,5,9,61,
  3,5,4
DIM POINTER(26) — Start number for
each letter
DATA 1,45,138,221,267,291,327,
  375,446,456,481,511,556
DATA 638,660,676,731,735,783,
  875,914,919,928,989,992,997
```

```
100 RESTORE
110 DIM POINTER(26,26)
120 FOR A = 1 TO 26
130 FOR B = 1 TO 26
140 READ POINTER(A,B)
150 NEXT B:NEXT A
160 DATA 1,1,3,4,4,4,8,9,10,10,11,12,22
170 DATA 24,24,31,31,32,37,40,42,43,43,43,44,44
180 DATA 45,45,45,45,68,68,68,83,84,84,84,89,89
190 DATA 89,95,95,95,105,105,105,125,125,125,125,137,137
200 DATA 138,138,138,138,158,158,158,159,163,163,163,164,164
210 DATA 164,175,175,175,207,207,207,217,217,217,217,217,217
220 DATA 221,221,221,221,235,235,235,235,245,245,245,245,245
230 DATA 245,249,249,249,257,257,257,259,259,259,259,264,264
240 DATA 267,267,267,269,269,269,269,269,269,269,269,273,279
250 DATA 280,280,280,280,282,283,283,283,284,284,284,284,284
260 DATA 291,291,291,291,297,297,297,297,301,301,301,307,307
270 DATA 307,310,310,310,317,317,317,325,325,325,325,325,325
280 DATA 327,327,327,327,335,335,335,335,338,338,338,344,344
290 DATA 344,346,346,346,357,357,357,371,371,371,371,371,371
300 DATA 375,375,375,375,403,403,403,403,413,413,413,413,413
310 DATA 413,420,420,420,420,420,420,436,436,436,436,445,445
320 DATA 446,446,446,446,446,446,446,446,446,446,446,447,448
330 DATA 449,449,449,449,451,452,452,452,454,454,454,454,454
340 DATA 456,456,456,456,464,464,464,464,464,464,464,464,464
350 DATA 464,468,468,468,468,468,468,479,479,479,479,479,479
360 DATA 481,481,481,481,481,486,486,495,496,496,496,503,503
370 DATA 504,506,506,506,508,508,508,509,509,509,509,510,510
380 DATA 511,511,511,511,524,524,524,524,537,537,537,543,543
390 DATA 543,544,544,544,544,544,544,551,551,551,551,554,554
400 DATA 556,556,556,556,597,597,597,597,604,604,604,604,604
410 DATA 604,615,615,615,615,615,615,615,630,630,630,630,637,637
420 DATA 638,638,638,638,642,642,642,642,649,649,649,649,649
430 DATA 649,653,653,653,653,653,653,658,658,658,658,658,658
440 DATA 660,661,662,663,663,663,664,664,664,664,664,665,665
450 DATA 667,667,667,667,668,670,670,670,670,673,673,673,673
460 DATA 676,676,676,676,694,694,694,704,707,707,707,712,712
470 DATA 712,714,714,714,721,721,721,728,728,728,728,728,728
480 DATA 731,731,731,731,731,731,731,731,731,731,731,731,731
490 DATA 731,731,731,731,731,731,731,731,731,731,731,731,731
500 DATA 735,735,735,735,745,745,745,745,753,753,753,753,753
510 DATA 753,760,760,760,760,760,760,777,777,777,777,781,781
520 DATA 783,783,795,795,800,800,800,805,817,817,825,827,828
530 DATA 838,839,843,843,843,843,848,866,866,871,871,873,873
540 DATA 875,875,875,875,883,883,883,886,896,896,896,896,896
550 DATA 896,899,899,899,904,904,904,908,908,908,908,912,912
560 DATA 914,914,914,914,914,914,914,914,914,914,914,914,914
570 DATA 914,914,914,914,914,914,914,914,914,914,914,914,914
580 DATA 919,919,919,919,919,919,919,919,919,919,919,919,919
590 DATA 919,919,919,919,919,919,919,919,919,919,919,919,919
600 DATA 928,928,928,928,945,945,945,954,962,962,962,962,962
610 DATA 962,978,978,978,985,985,985,985,985,985,985,988,988
620 DATA 989,989,989,989,989,989,989,989,989,989,989,989,989
630 DATA 989,989,989,989,989,989,989,989,989,989,989,989,989
640 DATA 992,992,992,992,992,992,992,992,992,992,992,992,992
650 DATA 992,992,992,992,992,992,992,992,992,992,992,992,992
660 DATA 997,997,997,997,997,997,997,997,997,997,997,997,997
670 DATA 997,997,997,997,997,997,997,997,997,997,997,997,997
```

Listing 1 Start point array

We will use the first three letters of the key surname (NAM$) and, as we are to use the ASCII codes, we must convert all to upper case, having first validated the input as being all alpha:

```
FOR Z = 1 TO 3
CO = ASC (MID$(NAM$,Z,1))
IF CO>90 THEN MID$ (NAM$,Z,1)
  =CHR$ (CO-32)
NEXT Z
```

We now require three pointers (PTRn), being the numbers in the alphabet for each letter of NAM$, when A=1:

```
PTR1 = ASC(NAM$)-64)
PTR2 = ASC(MID$(NAM$,2,1))-64
PTR3 = ASC(MID$(NAM$,3,1))-64
```

The variable POINTER(PTR1) will now give us the start of the records beginning with the first letter of NAM$. We now need to find how far into the range the second letter should take us; this is achieved by taking the ALPH(PTR1) value, divide by 26 and multiply by PTR2:

```
PPN1 = ALPH(PTR1)/26xPTR2
```

We also apply this to the third letter:

```
PPN2 = ALPH(PTR1)/676xPTR3
```

The final line to find the record position would be:

```
RPOS = INT((POINTER(PTR1) +PPN1
  +PPN2) x ADJ)
```

where ADJ is the adjuster for the number of records, obtained by the formula: maximum number of records this file is designed to accommodate/1000.

Let us now work an actual example using the name most commonly found in hotel registers: SMITH.

```
NAM$ = "SMITH"
PTR1 = ASC(NAM$)-64
  (PTR1 = 19)
PTR2 = ASC(MID$(NAM$,2,1))-64
  (PTR2 = 13)
PTR3 = ASC(MID$(NAM$,3,1))-64
  (PTR3 = 9)
POINTER(PTR1) (Start of "S" = 783)
PPN1 = ALPH(PTR1)/26xPTR2
```

Part 1 To find hash for record position

```
5000 REC=(maximum records in file):ADJ=REC/1000
5010 FOR Z=1 TO 2
5020 CO=ASC(MID$(NAM$,Z,1)
5030 IF CO>90 THEN MID$(NAM$,Z,1)=CHR$(CO-32)
5040 NEXT Z
5050 PTR1=ASC(NAM$)-64
5060 PTR2=ASC(MID$(NAM$,2,1)-64
5070 RPOS=INT(POINTER(PTR1,PTR2)*ADJ)
```

Part 2 To return it 'search' or find empty record if 'add':

```
5110 IF S=2 THEN RETURN
5120 IF NOT TABLE(RPOS) THEN TABLE(RPOS)=1:PUT #?,RPOS,TABLE(RPOS):RETURN
5130 IF TABLE(RPOS)=1 THEN GOTO 5160
5140 IF TABLE(RPOS)<0 THEN TABLE(RPOS)=ABS(TABLE(RPOS)):
     PUT #?,RPOS,TABLE(RPOS):RETURN
5150 RPOS=RPOS+TABLE(RPOS)-1:GOTO 5130
5160 PUSH=1
5170 FOR Z=RPOS+1 TO REC
5180 IF NOT TABLE(Z) THEN GOTO 5210
5190 PUSH=PUSH+1
5200 NEXT Z
5210 TABLE(Z)=1:PUT #?,Z,TABLE(Z)
5220 TABLE(RPOS)=PUSH+1:PUT #?,RPOS,TABLE(RPOS):RPOS=RPOS+PUSH
5230 RETURN
     (RETURNS to adding will hold RPOS for - PUT #?,RPOS,RECORD$)
```

Part 3 On return to 'search' routines

```
2000 GET #?,RPOS,RECORD$
2010 CLS:PRINT (required display of RECORD$)
2020 IF TABLE(RPOS)>1 THEN RPOS=RPOS+TABLE(RPOS)-1:PRINT "MORE RECORDS":
     (suitable pause statement):GOTO 2000
2030 IF TABLE(RPOS)<1 THEN RPOS=RPOS+(ABS(TABLE(RPOS)))-1:GOTO 2020
2040 PRINT "END OF RECORDS FOR ";NAM$
2050 (pause statement):GOTO (menu)
```

Part 4 Deletions — Use search to find records, offer continue or delete, if delete then GOSUB 7000

```
7000 TABLE(RPOS)=-TABLE(RPOS)
7010 PUT #?,RPOS,TABLE(RPOS)
7020 RETURN

N.B. From input stage:- NAM$=(key field):S=1 for add, S=2 for search:
                        GOSUB 5000
```

Listing 2 Algorithm

(PPN1 = 46 (after "SA"))
PPN2 = ALPH(PTR1)/676xPTR3
(PPN2 = 1.22 (after "SM"))
RPOS = INT((783+46+1.22)/1)
(RPOS = 830)

From this we will see that the record with key field SMITH (or Smith) will be placed at position 830. In this context it should be noted that some disk-filing systems will use the record number directly, but others require a pointer to be set at a specified number of bytes into the file. In the latter case it will be necessary to convert RPOS further in order to find the pointer position:

PPOS = RPOSx(record length + record overhead)

Having finally arrived at either the record position or the pointer position we can *put* the whole record into the file; a subsequent search for Smith will produce the same hash and then *get* the original record instantly.

We now have to consider the collision circumstances where a new record produces the same hash as an existing one and therefore that file position is already filled. In addition to the record file, the storage medium will also contain a file in which is recorded the present state of each position in the record file. The contents of this second file will be loaded into an array, say TABLE(), on starting up.

When the original empty file is created, every element of TABLE() will contain 0 to indicate an empty record. When the first Smith is added, TABLE(830) will be changed to one in order to indicate a record position filled. When the second Smith record is added, the system will find that TABLE(830) is already occupied and must then look forward to locate the next TABLE() which contains a 0. If this is found at N (say, four) records further on, then TABLE (830) will be changed to N+1 and TABLE (834) will be changed to one. The result of this is that when a search is made, the system will know from TABLE(hash) the following:

If 1: then this is the last record for this hash.

If > 1: then there is another record for this hash which is the value of current TABLE()-1 records further on.

It is necessary to increase the 'more records' indicator by one in order to avoid the circumstances where the next empty TABLE() is in fact the next record, and without this increase the value of last TABLE() would remain at one. This would indicate the last record for the hash, which in these circumstances is not true; conversely, it is necessary to deduct one from the indicator when searching.

The record position indicated by the hash will also be the position for the TABLE() record, and every time an element of TABLE() is changed, the system will *put* the new value into the file.

What, you may ask, happens when a record is deleted? Well, the solution to this is fairly simple. We do not shuffle all the 'same hash' records to fill the gap, but instead we negate the TABLE() value for that particular record. Subsequently, when adding, and the system finds a TABLE() less than 0, it will return the value to ABS and fill the space with the new record. When searching, the system will bypass any records where TABLE() is negative but use the ABS value (if not one) to find the next record.

This hashing system assumes that the second letter usage is the same as the first but, of course, this is not so; there are more peculiarities in the alphabet not yet mentioned. With a combination of any three from 26 different ones, we have a total of 17,576 possibilities. Many of these, of course, are not feasible — for example, QZW or 000. It has also been found that in a name starting with a vowel, the second letter can be almost any other in the alphabet; in names starting with a consonant, however, the second letter is almost always a vowel; in the few exceptions to this rule the third letter is always a vowel. With this in mind, the letters A and B were examined in greater detail and the results are as follows:

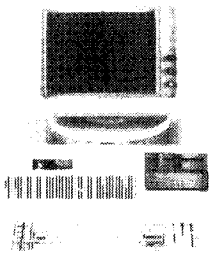
First two letters:
A — 25 of 26 possibles
B — 9 of 26 possibles
First three letters:
A — 256 of 676 possibles
B — 124 of 676 possibles

To project this into the whole alphabet we will have five letters at 256 and 21 letters at 124, giving a total of 3884, or about 22 per cent of the possibles. Many of these could be regarded as special cases — for example, all the BHs are Asian names and all the BJs are Scandinavian names. The letter Q is another exception as there are only two significant combinations — QA(59 entries) and QU(2125 entries).

Fig 3 shows the breakdown for the range BA-BZ with actual entries, share of 1000 and record start positions. One column in the directories can show up to 131 lines, but to allow for two-line entries a column has been taken as 125 entries. In this examination the following entries were not included:

(1) All business names starting with capital letters — for example, B B Bakeries Pty Ltd.

HYPEC SUPER PC



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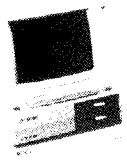

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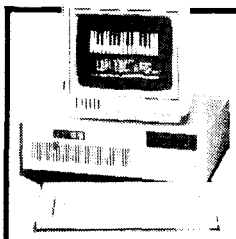

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(2) Certain large blocks starting with a particular name.

It will be seen from Fig 3 that the shifting effect that the third letter would have is very small and, indeed, for practical purposes, may be ignored. Given that we had the detail for every letter as shown in Fig 3 for B, then we can simplify the algorithm as the start point for every possible two-letter combination would be known. This will now require one two-dimensional array — say, POINTER(26,26) where POINTER(1,1) to POINTER(1,26) will be the start points for AA to AZ, and so on.

We can now proceed to the more accurate stage two of the algorithm, and the program part to create the start point array (POINTER()) is given in Listing 1. This could, as an alternative, be read in from a file on the storage medium. The next step in the process is the actual algorithm which is given in Listing 2 (part 1). You will see that this is now much simpler than the original one, as the shifting effect of the second letter is known and not calculated as an estimate.

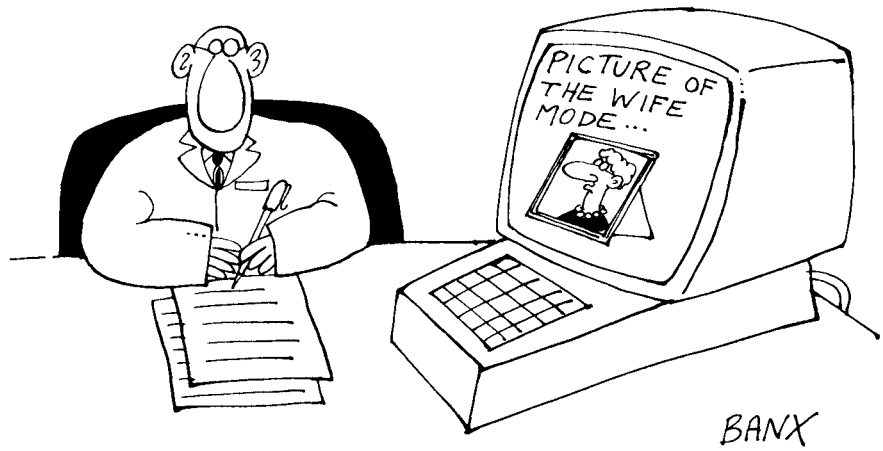
Now to the problem of collisions which are dealt with in Part 3. This decides from the value of TABLE(RPOS) the following:

If 0 this is an empty record so return.
IF <0 then this is a space from a previous deletion so return to ABS and use for new record.
IF >0 then this record position is already fitted — that is, there is a collision, so find last record for this hash, then find next empty record, update the value of RPOS and adjust the values of TABLE accordingly.

The listing shown in part 3 is upon return to the search routine and finds all records in turn with the same hash as produced by the name enquired for.

The part 4 listing shows the system for deletions (note that the actual record data on disk is not overwritten, only the value of TABLE(RPOS) is changed). You could write a string of record length spaces to this position if you wish, but there is no real purpose served by doing this.

These listings should be syntactically correct for most DOSs, but in any case only small changes would be necessary to suit. END



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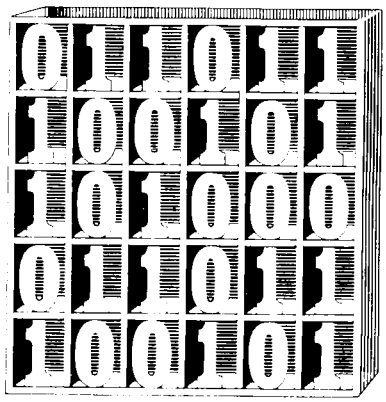

David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to Subset, APC, 2nd Floor, 215 Clarence Street, Sydney 2000.

6502 PARITY

Some processors — the Z80, for example — have automatic hardware parity flagging. One bit in the status register is set if the data resulting from an operation contains an even number of 1 bits. An odd number of 1s in the result clears the parity flag. The 6502 does not flag parity.

Parity is most often used by serial I/O devices as a simple, quick and fairly reliable method of testing for data corruption. Most of these devices automatically compute and transmit parity bits on data output, or recompute parity and check the result against the received parity on input, and the entire process is transparent to the programmer. However, parity may be quite a useful facility in other situations, and if not flagged automatically by the processor, it must be calculated by software methods.

PARITY (Datasheet 1) from John Kerr demonstrates one possible software method of finding parity in 6502 data. The algorithm used could be applied more generally to return a flag (Carry) showing the parity of any length data, but John has written the routine to perform the more specific task of conditioning the parity of 7-bit data (ASCII) to either odd or even parity, depending on the state of input Carry. The parity bit is returned appended to the data as bit 7.

John is understandably grieved that such a simple task should take 24 bytes, but it is a Class One routine. Improvements will be printed only if also Class One, and return parity status in the Carry flag of all eight bits of data in A.

```
;
;CLASS 1      *discreet       *interruptable      *promable
;******       *reentrant      *relocatable        *robust
;
STACK  =     $0100      ;6502 fixed stack address.
;
PARITY ROL   A          ;Get parity bit, drop 7,A.          2A
       PHA              ;Save A.                            48
       PHA              ;Stack working byte.                48
       TXA              ;Save X for use indexing stack.     8A
       PHA              ;                                   48
;
       TSX              ;Index stack.                       BA
       SEC              ;Ensure loop terminates after       38
                        ;8 bits counted.
       LDA  #0          ;Clear parity 1s count.             A9 00
;
       .BYTE $2C        ;Skip "ADC  #0" 1st time by         2C
                        ;pseudo "BIT  $0069".
;
LOOP   ADC  #0          ;Inc A only if bit set.             69 00
       ROL  STACK+2,X   ;Get next working byte bit to C     3E 02 01
       BNE  LOOP        ;and repeat for 8 bits.             D0 F9
                        ;Last bit is initially set C and
                        ;is not looped.
;
       LSR  A           ;Move computed parity bit to C.     4A
       PLA              ;Restore X.                         68
       TAX              ;                                   AA
       PLA              ;Clear working byte from stack.     68
       PLA              ;Restore A and move computed        68
       ROR  A           ;parity bit to 7,A.                 6A
       RTS              ;Exit PARITY.                       60
;
```

DATASHEET 1

```
;
;= PARITY    Parity bit generation.
;
;JOB         To convert 7-bit value to 8-bit odd or even parity.
;ACTION      Append odd/even parity request bit to data byte.
;           Clear parity 1s count.
;           FOR data bits: [ Shift next bit to Carry.
;                            Count = count + Carry. ]
;           Move count bit 0 to data bit 7.
;
;CPU         6502.
;HARDWARE    None.
;SOFTWARE    None.
;
;INPUT       A = data byte (7-bit value).
;           C reset: even parity requested.
;             set:   odd parity requested.
;OUTPUT      Parity bit 7,A set/reset on parity of A.
;           C unchanged. V = 0.
;           N = parity bit (bit 7,A).
;           Z = 1 if A = 0.
;           All other registers unchanged.
;ERRORS      None.
;REG USE     A P
;STACK USE   3
;RAM USE     None.
;LENGTH      24
;CYCLES      152
```

Z80 SPELLER

SPELL (Datasheet 2) from John Hardman is an intriguing little routine to check for some of the more common mistakes made by typists. There are the errors of omission, insertion, transposition and substitution.

The routine requires the addresses of both the word to be checked and of the word it is to be checked against; it also needs the length of both words. In any real application, support routines would calculate the word lengths, and also step through a dictionary table indexing each word in turn until a match is found by SPELL or the table is exhausted.

SPELL must be used with some degree of caution. John has provided examples of the mistyped 'JOJN', 'JOGHN', 'JON' and 'JHON' all being matched to the correct 'JOHN', but not of the correctly typed 'FREE; 'RED', 'FEED', 'BRED', 'FED', 'FREED', 'FIRED' and 'FLED', all incorrectly matched to poor old 'FRED'.

DATASHEET 2

```
;
;= SPELL     Spelling check.
;
;JOB         To compare a test word with one known to be correct
;           and flag an exact match or any one of the errors of
;           single-letter omission, insertion or substitution or
;           of adjacent letter transposition.
;ACTION      IF   either wordlength is zero
;           THEN clear match flag.
;           ELSE IF   wordlengths are equal
```

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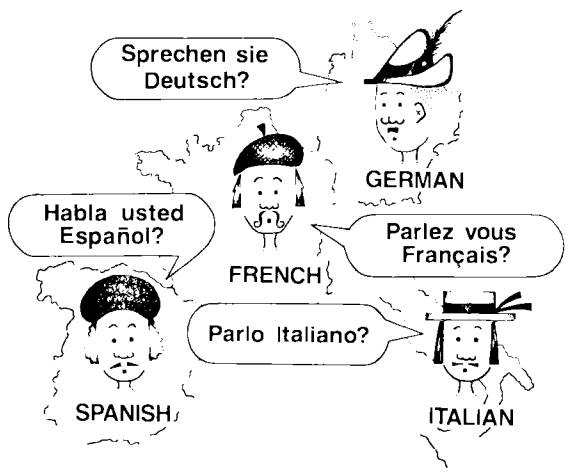

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```
:                  THEN IF   only one char differs
:                       THEN set match flag.
:                       ELSE IF   only two adjacent chars differ
:                            THEN IF   differing chars crossmatch
:                                 THEN set match flag.
:                                 ELSE clear match flag.
:                            ELSE clear match flag.
:                  ELSE IF   wordlengths differ by 1 char
:                       THEN IF   remaining chars match
:                            THEN set match flag.
:                            ELSE clear match flag.
:                       ELSE clear match flag.
:-------------------------------------------------------------------------
:CPU          Z80
:HARDWARE     Memory containing the two words.
:SOFTWARE     None.
:-------------------------------------------------------------------------
:INPUT        HL addresses 1st letter of word to check.
:             B = length of word to check.
:             DE addresses 1st letter of correctly spelled word.
:             C = length of correctly spelled word.
:OUTPUT       Z = 0; zero length words or no close match found.
:             Z = 1; words either match exactly or differ only by
:                    one letter missing, extra, wrong or displaced
:                    by one position.
:             All other flags changed.
:             All other registers and data unchanged.
:ERRORS       None.
:REG USE      B C DE HL F
:STACK USE    8
:RAM USE      None.
:LENGTH       77
:CYCLES       Not given.
:-------------------------------------------------------------------------
:CLASS 1      *discreet      *interruptable      *promable
:******       *reentrant     *relocatable        *robust
:=========================================================================

:
SPELL   PUSH BC         :Save registers.                    C5
        PUSH AF         :                                   F5
        PUSH DE         :                                   D5
        PUSH HL         :                                   E5
:
        LD   A,C        :Check length of correct word       79
        OR   A          :for 0, if it is then               B7
        JR   Z,NOMTCH   :exit, no match.                    28 3D
:
        LD   A,B        :Check length of test word          78
        OR   A          :for 0, if it is then               B7
        JR   Z,NOMTCH   :exit, no match.                    28 39
:
        SUB  C          :Compare lengths - if equal then    91
        JR   Z,EQUAL    :check for subst. or trans.         28 0D
:
        INC  A          :If test word 1 char short then     3C
        JR   Z,RMOVAL   :check for missing character.       28 06
:
        CP   2          :If test word not 1 char too many   FE 02
        JR   NZ,QUIT    :then exit, no match.               20 31
:
        EX   DE,HL      :HL addresses shorter word and      EB
        LD   B,C        :B contains its length.             41
:
RMOVAL  LD   C,1        :Flag insertion or omission         0E 01
        JR   LESONE     :and go test.                       18 02
:
EQUAL   LD   C,2        :Flag transpose or substitution.    0E 02
:
LESONE  DEC  DE         :initialise for increment.          1B
:
LOOP    INC  DE         :Address next character             13
        LD   A,(DE)     :and get in A for comparison        1A
        CP   (HL)       :with other word.                   BE
        JR   NZ,DIFFER  :Go test for error if different.    20 05
:
INLOOP  INC  HL         :Else address next character and    23
        DJNZ LOOP       :repeat until end of word           10 F8
        JR   QUIT       :then exit, match.                  18 1E
:
DIFFER  DEC  C          :Loop back for continued testing if 0D
        JR   Z,LOOP     :insertion or omission flagged.     28 F3
:
        DEC  C          :Exit, no match on 2nd difference   0D
        JR   NZ,QUIT    :after insertion or omission.       20 18
:
        DEC  B          :Else test if at end of word        05
        JR   Z,QUIT     :and exit, match, if so.            28 15
:
        INC  DE         :Else address next character        13
        INC  HL         :of both words and check for match. 23
        LD   A,(DE)     :if characters match then           1A
        CP   (HL)       :substitution found, so continue    BE
        JR   Z,INLOOP   :checking rest of word.             28 EC
:
        DEC  HL         :Else check for transposition.      2B
        CP   (HL)       :Exit, no match, if previous char   BE
        JR   NZ,QUIT    :of test word is different.         20 0D
:
        INC  HL         :Else compare current char of       23
        DEC  DE         :test word against previous         1B
        LD   A,(DE)     :char of correct word               1A
        CP   (HL)       :and exit, no match, if             BE
        JR   NZ,QUIT    :chars are different.               20 05
:
        INC  DE         :Transpose, so adjust pointer and   13
        JR   INLOOP     :continue checking rest of word.    18 DF
:
NOMTCH  SUB  A          :Ensure Z clear to flag no match    97
        INC  A          :on exit.                           3C
```

```
;
QUIT    POP   HL         ;Restore registers.                E1
        POP   DE         ;                                  D1
        POP   BC         ;Restore A via B, leaving exit     C1
        LD    A,B        ;flags unaffected by POP.          78
        POP   BC         ;                                  C1
        RET              ;Exit SPELL with flag info.        C9
;
```

Z80 & 6502 CONDITIONS

Stephen Smith has written bemoaning the Z80's lack of complex conditional jumps that would correspond to the relational operators <, =<, =, >=, > and <> of Basic.

The instruction sets of more advanced processors, such as the 6809, 8086 and 68000, include branches which are performed on the condition of multiple flags, but Z80 jumps, relative jumps, calls and returns act only on single flag states. The 6502 branch instructions also act only on single flag states.

Figs 1 and 2 show ways in which the six relational tests can be performed for the Z80 and 6502 after a compare instruction has been performed. Points to note are that the two processors set Carry differently to denote a borrow, and that absolute jumps must be used for the Z80 if tests are made on any flags other than Zero or Carry. The Z80 list is 8080-compatible.

Fig 1

```
;
;Z80/8080          Condition    Test          flags tested: S Z V C
;
;...Unsigned relational jumps
;
JB      JP    C,TRUE     :<    C          [ C = 1 ]              - - - 1
;
JBE     JP    C,TRUE     :=<   C+Z        [ C or Z = 1 ]         - ? - 1
        JP    Z,TRUE     :                                  or  - 1 - ?
;
JE      JP    Z,TRUE     :=    Z          [ Z = 1 ]              - 1 - -
;
JAE     JP    NC,TRUE    :>=   ~C         [ C = 0 ]              - - - 0
;
JA      JP    Z,FALSE    :>    ~C.~Z      [ Z = 0 and C = 0 ]    - 0 - 0
        JP    NC,TRUE    :
FALSE                    :
;
JNE     JP    NZ,TRUE    :<>   ~Z         [ Z = 0 ]              - 0 - -
;
;...Signed relational jumps
;
JL      JP    PO,NV      :<    ~S.V+S.~V                         0 - 1 -
        JP    P,TRUE     :     [ S <> V ]                  or    1 - 0 -
        JP    FALSE      :
NV      JP    M,TRUE     :
FALSE                    :
;
JLE     JP    Z,TRUE     :=<   Z+~S.V+S.~V                       ? 1 ? -
        JP    PO,NV      :     [ Z = 1 or S <> V ]         or    0 - 1 -
        JP    P,TRUE     :                                 or    1 - 0 -
        JP    FALSE      :
NV      JP    M,TRUE     :
FALSE                    :
;
JE      JP    Z,TRUE     :=    Z    [ Z = 1 ]                    - 1 - -
;
JGE     JP    PE,V       :>=   ~S.~V+S.V                         0 - 0 -
        JP    P,TRUE     :     [ S = V ]                   or    1 - 1 -
        JP    FALSE      :
V       JP    M,TRUE     :
FALSE                    :
;
JG      JP    Z,FALSE    :>    ~S.~V.~Z+S.V.~Z                   0 0 0 -
        JP    PE,V       :     [ Z = 0 and S = V ]         or    1 0 1 -
        JP    P,TRUE     :
        JP    FALSE      :
V       JP    M,TRUE     :
FALSE                    :
;
JNE     JP    NZ,TRUE    :<>   ~Z    [ Z = 0 ]                   - 0 - -
;
;
```

Fig 2

```
;
;6502              Condition    Test          flags tested: N V Z C
;
;...Unsigned relational jumps
;
```


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SUBSET

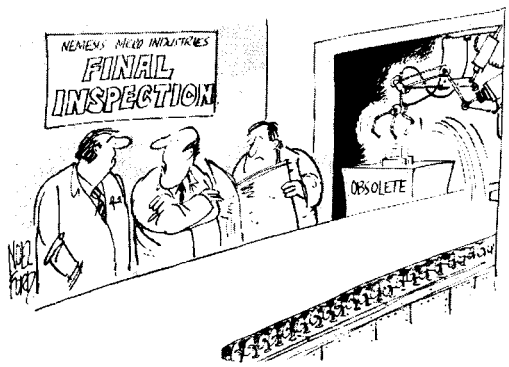
```
JB      BCC   TRUE      :<   ~C      [ C = 0 ]              - - - 0
:
JBE     BCC   TRUE      :=<  ~C+Z    [ C = 0 or Z = 1 ]     - - ? 0
        BEQ   TRUE      :                              or   - - 1 ?
:
JE      BEQ   TRUE      :=   Z       [ Z = 1 ]              - - 1 -
:
JAE     BCS   TRUE      :>=  C       [ C = 1 ]              - - - 1
:
JA      BEQ   FALSE     :>   C.~Z    [ Z = 0 and C = 1 ]    - - 0 1
        BCS   TRUE      :
FALSE                   :
:
JNE     BNE   TRUE      :<>  ~Z      [ Z = 0 ]              - - 0 -
:
:...Signed relational jumps
:
JL      BVC   NV        :<   ~N.V+N.~V                      0 1 - -
        BPL   TRUE      :    [ N <> V ]                or   1 0 - -
        BMI   FALSE     :
NV      BMI   TRUE      :
FALSE                   :
:
JLE     BEQ   TRUE      :=<  Z+~N.V+N.~V                    ? ? 1 -
        BVC   NV        :    [ Z = 1 or N <> V ]       or   0 1 - -
        BPL   TRUE      :                              or   1 0 - -
        BMI   FALSE     :
NV      BMI   TRUE      :
FALSE                   :
:
JE      BEQ   TRUE      :=   Z   [ Z = 1 ]                  - - 1 -
:
JGE     BVS   V         :>=  ~N.~V+N.V                      0 0 - -
        BPL   TRUE      :    [ N = V ]                 or   1 1 - -
        BMI   FALSE     :
V       BMI   TRUE      :
FALSE                   :
:
JG      BEQ   FALSE     :>   ~N.~V.~Z+N.V.~Z                0 0 0 -
        BVS   V         :    [ Z = 0 and N = V ]       or   1 1 0 -
        BPL   TRUE      :
        BMI   FALSE     :
V       BMI   TRUE      :
FALSE                   :
:
JNE     BNE   TRUE      :<>  ~Z   [ Z = 0 ]                 - - 0 -
:
:
```

REPRINTS?

New readers continue to write in asking for early Datasheets to be reprinted — usually because routines published later call them as subroutines. I'm sorry to say that since the amount of new material submitted greatly exceeds the space available, it simply is not possible to do more than give date references to the earlier routines.

All is not lost, however. Most Z80 and 6502 routines from the early years of SubSet appear in my books *Assembler Routines for the Z80 and Assembler Routines for the 6502* (published by Century Communications). Both books contain complete SubSet Datasheet documentation standards and a brief history of its development. They can be obtained from John Egan at McGills Bookshop in Melbourne. Tel: (03) 602 5566.

END



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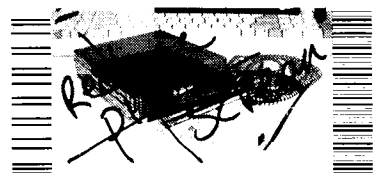

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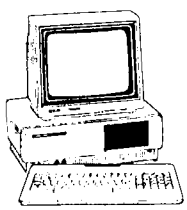

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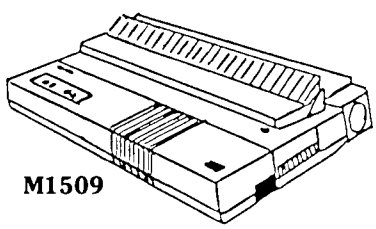

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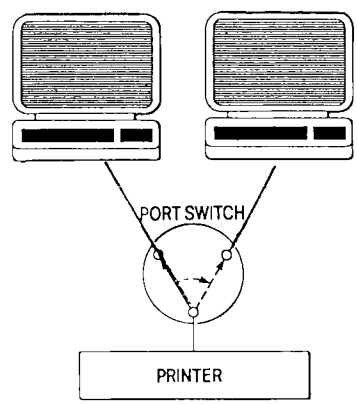

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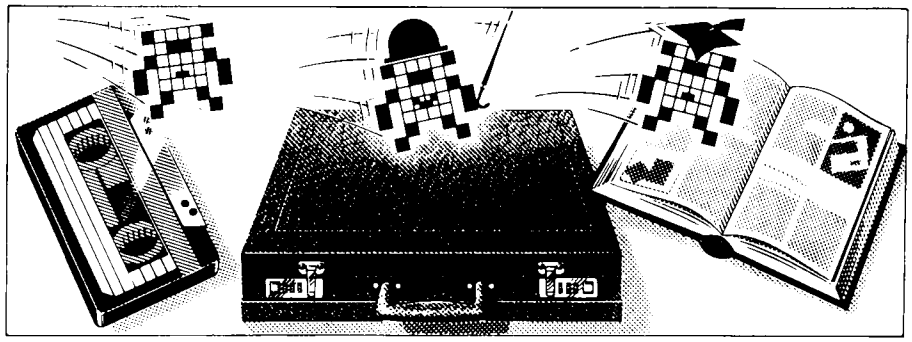

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Owen Linderholm selects the best of readers' programs. For details on submitting your own, see the end of this section.

Once again, I must stress the type of programs I would like to see in Program File. Original ideas and applications that can be performed well by a micro are more than welcome, as are good utility programs and routines to be incorporated in longer programs. Any games submitted must be both original and challenging.

Programs should not be too long since people will not be willing to type them in (exceptions can be made for extremely high-quality programs such as the Expert System published in March). There should not be too much machine code or too many long data statements, as these are especially tiresome to type in. Small amounts are acceptable, but commented source code is preferable.

I am also concerned that it should be as easy as possible to convert programs to different machines. This means that programs in standard Basic, or standard forms of other languages, will be more welcome. Any parts of code that are specific to a particular machine or which rely on specialised hardware should be carefully explained.

Most people would like to know how the programs they use work, so all submissions must be accompanied by documentation or comments that explain how the unusual parts of the code work.

All submissions should be on cassette or disk, with a separate listing. If your submissions are to be returned, they must be accompanied by a stamped addressed envelope. Further details on submitting programs are given at the end of Program File.

This month's Program of the Month has an educational flavour. It has been written for very young children, and is unusual in that the author has taken extreme care to ensure that the program is as easy to use, understandable and coherent as possible. The program, simply called Order, has been written by J O'Callaghan who works in the educational computing field. Its purpose is to introduce the concepts of ordering sets of objects to the very young. A full explanation of the reasoning behind the program is given before it.

Other programs this month include a sequel to Kevin Riordan's 'Wizard of Odds' race analysis program, a mailmerge routine for the QL and a program for producing simple but neat-looking bar charts, pie charts and line graphs with the Spectrum.

Tips include a graphics hint for the Atari 520ST and how to use your Epson HX-20 as a printer buffer for another micro.

Program of the Month

BBC Order

by J O'Callaghan

MICROTEX 666

This program is available electronically through Microtex 666's software downloading service. It is accessed through Viatel page *66637#.

This program allows young children to practise and solve problems which relate to ordering sets of objects, and it was designed with some specific aims in mind.

Firstly, as there exists a shortage of serious educational software for the very young, the program should be targeted at that age range.

Secondly, the age at which children are able to appreciate the concepts of bigger, smaller, biggest, smallest, and so on, tends to be well below their reading age. Consequently, normal methods of providing work for children on these concepts, — say, worksheets or workcards, tend to be of little use due to the language limitations. Therefore, no language should be needed for the part of the program the children use.

Thirdly, most parents and teachers are bound to have different ideas and preferences for the presentation of material to their children. However, almost all educational programs provide the user with only one fixed method of presentation and only a limited amount of flexibility concerning the level of work. The program, therefore, should allow the parent or teacher to decide upon the exact method of presentation and give maximum choice over the widest range of possible problems.

The program Order goes a long way to fulfil these three aims.

The children have to put into order five sets of shapes. They are presented with five large boxes containing these sets, below which are five empty boxes. The order of the boxes on the top line has been randomly mixed so that the sets are no longer in order. The task for the child is to transfer the boxes from the top row into the bottom row, in the correct order. For example, the top row

might contain, in this sequence: two triangles, five squares, one star, three triangles, four stars. After transfer the bottom row should contain: one star, two triangles, three triangles, four stars, five squares.

When the problem starts, each set of shapes on the top row will, in turn, change colour from white to blue. A set from the top row is transferred to the bottom row by pressing the space bar, while that set is coloured blue. If the choice made is a correct one the program will move on; if not, the incorrect set on the bottom row will be wiped out and the child will have to try again.

This continues until the correct set of shapes has been put into all five empty boxes on the bottom line. When this happens, there will be a match-up between each set and the number of shapes in each set; for example, under a set containing three stars, the number three will appear.

At the end of each problem, the child must press the space bar to move on.

The key part of the program comes at the beginning, when the parent or teacher makes certain choices from the two 'selection pages' which determine the type of problem to be solved. Below are a set of descriptions outlining the various components of the selection pages:

SHAPES: typing in B, T or S will make sure that only boxes, triangles or stars will appear in the sets of information. Typing M, on the other hand, will mix them up so that some of the sets might be triangles, some stars, and so on.

FEEDBACK: here, the user has the choice of T for ticks, X for crosses and ticks, and S for sound only. Many parents and teachers do not like to see a lot of crosses on childrens' work, and this option provides them with the chance to decide on what type of response the child should get for correct and incorrect answers.

ORDER: the problems can either be set in ascending (A) or descending (D) order.

POSITION: R for random will result in the position of the shapes being randomly arranged in each set, and will make the problem more complex. However, if P for pattern is selected, the shapes will be positioned in a sequence which has a building block effect, which means that the bottom row will be filled before the next row is started on. As you can see, this building block effect provides the child with some help as to which of the sets should be selected:

```
                    *
  *   **  ***  ***  ?
***  ***  ***  ***
```

For the same descending problem, the shapes would be arranged this way:

```
**   *
***  ***  ***  **   ?
***  ***  ***  ***
```

This means that the general slope of the shapes will coincide with the slope in the picture clue explained later in this introduction.

RANGE: the number of possible shapes in each set can vary from one to nine. R will select a random range of numbers. If a specific range is required, you must type in the lowest number in that desired range; for example, typing in 2 will select the range two – six.

ELIMINATION: when this option is selected, an incorrect choice is eliminated from the top row; this will make the choice easier next time around. If mistakes are continually made, then after four incorrect choices, the correct choice will be the only one left.

PICTURE: if you select this facility, a picture of an incline will be drawn. The slope of the incline will be going up if the problem is an ascending one and down if it is descending. Depending on the type of problem, a man will also be placed at either the bottom or top of the slope. This should provide some help to the child in deciding what kind of problem has been set. At the end of the problem, when the correct soloution has been arrived at, the man will then either move up or down the slope towards the opposite end of the incline.

TIME DELAY: this fixes the time, in seconds, that each individual set is made available for selection by the child. After the period of time has expired, the next set will be made available, and so on. This means that the speed of the program can be matched to the need of each individual child. Only values between one and 60 will be accepted.

NUMBER OF QUESTIONS: this option sets the number of questions that will be presented to the child on a particular type of problem. Up to 20 questions may be selected. However, a particular type of question may be continually repeated by entering zero for this option. This instructs the program to keep repeating questions on the type of problem that has been decided upon, and an R will appear instead of zero when the Return key is pressed.

The space bar will have to be pressed to move on from the end of each question. If there are still more questions, the next one will be displayed; if not, then the program will return to the selection pages. To get out of the repeat cycle, the Escape key must be pressed at the end of the question to bring the program back to the selection pages. This facility is available any time at the end of a question in case a sequence of questions needs to be halted.

SOUND LEVEL: the user has the choice of 0, 1 or 2 which correspond to no sound, sound at half the normal volume and normal volume. These three options will only allow the entry of numbers, and only two of them at most. When the correct number has been entered, the Return key must be pressed. Prior to pressing the Return key, alterations may be made to any entry by using the Delete key.

After setting the problem it will be necessary, especially when a child is first using the program, for the parent or teacher to explain what is happening and what is expected of him or her. For the first few times, it may even be advisable for the parent or teacher to work through a few problems with the child. After using the program the child should, from the visual clues, be able to decide what kind of problem it is and how to solve it.

Pressing the Break key at any time

SHAPES	B	T	S	M	B	M	T	M	S	M	B	M	M
ORDER	A	A	A	A	A	A	D	D	D	D	D	A	D
POSITION	P	P	P	P	P	P	P	P	P	P	P	R	R
RANGE	1	1	1	1	4	5	2	3	R	R	R	R	R
ELIMINATION	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
TIME	5	5	5	5	5	5	4	3	2	1	1	1	1

Fig 1 A suggested progression of problems

PROFOUND

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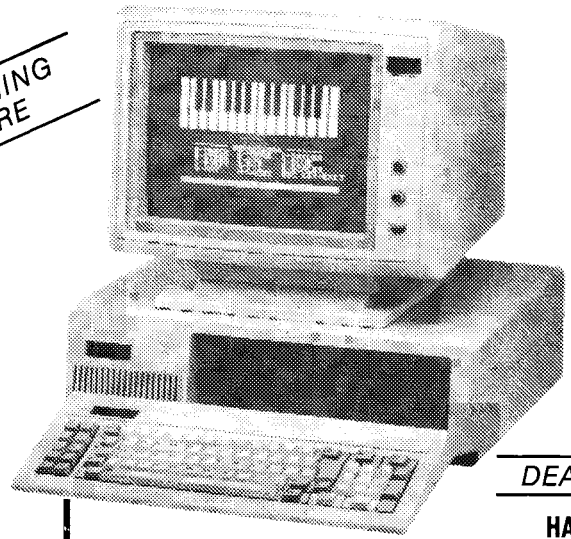

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will cause the program to start all over again.

A suggested progression of problems is tabulated in Fig 1.

FEEDBACK, PICTURE, NUMBER OF QUESTIONS and SOUND are all a matter of personal preference and are therefore not included in Fig 1.

Apart from the first four selections, Fig 1 only attempts to indicate the range of possible problems. There are many more intermediate steps that could be inserted into the table.

Generally, you should concentrate on a single concept at a time. For example, the first four selections in Fig 1 only change one parameter — the shape. This way, the child is able to see that the problem is not affected by the type of shape but by how many shapes there are. After that, the next progression is to increase the number of shapes. The rest of the table indicates the general trend you might take. The order in which the parent or teacher introduces the different concepts will, of course, depend upon personal preference.

```
100MODE 7
110PROCfront
120PROCsetup
130PROCinit
140REPEAT
150MODE5:PROCsetup1
160PROCputinorder
170PROCcorrect
180PROCmoveon
190UNTIL pass%=nq% OR flag=FALSE
200RUN
210:
220:
230:
240DEF PROClayout:X=XX
 250FOR I%=1TO5:GCOL0,1:PROCbox(X,YY+BB,X+AA,YY):PROCbox(X,YY+2*
    BB+VV,X+AA,YY+B  B+VV):GCOL0,3:PROCoutline(X,YY+BB,X+AA,YY):
    PROCoutline(X,YY+2*BB+VV,X+AA,YY+BB+V  V):X=X+AA+HH:NEXT
260ENDPROC
270:
280DEF PROCbox(X1,Y1,X2,Y2)
290PLOT4,X1,Y1:PLOT4,X1,Y2:PLOT85,X2,Y1:PLOT4,X2,Y2:PLOT85,X1,Y2
300ENDPROC
310:
320DEF PROCdelay(time)
330TIME=0:REPEAT UNTIL TIME=time
340*FX15,1
350ENDPROC
360:
370DEF PROCrandom
380IF N%=1 THEN RR=RND(5)
390MO(1)=0:I%=0
400REPEAT
410R=RND(5)+RR-1
420flag=TRUE
430FORK%=1TOI%
440IFR=MO(K%)THEN flag=FALSE
450NEXT
460IF flag=FALSE THEN 410
470I%=I%+1:MO(I%)=R
480UNTIL I%=5
490ENDPROC
500DEF PROCplot
510GCOL0,3:XT=XX
520FOR K%=1TO5:PROCorder(XT,YU,MO(K%)):XT=XT+AA+HH:NEXT
530ENDPROC
540:
550DEF PROCarrow(num,col):GCOL0,col
560XA=XX+104+(num-1)*(AA+HH):YA=YY-20
570PLOT4,XA,YA:PLOT4,XA+104,YA-100:PLOT85,XA-104,YA-100
580ENDPROC
590:
600DEF PROCwhitarr
610GCOL0,3:PLOT4,XA,YA-16:PLOT4,XA+80,YA-88:PLOT85,XA-84,YA-88
620ENDPROC
630:
640DEF PROCselect
650PROCdelay(500)
660SOUND1,-14*s1,100,6
670XT=XX
680K%=1
690IF MT%(K%)=FALSE THEN 780
700VDU19,0,7,0,0,0:GCOL0,0:PROCorder(XT,YU,MO(K%)):PROCoutline(XT,
    YU,XT+208,YU +208):VDU19,0,4,0,0,0
710time=del*100
720*FX15,1
730TIME=0:sel$=INKEY$(time):time1=TIME
740IF sel$=" " THEN sel=K%:GOTO810
750IF time1<(time-2) THEN time=time-time1:GOTO 730
760IF MT%(K%)=FALSE THEN 780
770VDU19,0,7,0,0,0:GCOL0,3:PROCorder(XT,YU,MO(K%)):PROCoutline(XT,
    YU,XT+208,YU +208)
780XT=XT+AA+HH
790K%=K%+1:IFK%>5THEN670
800GOTO690
810GCOL0,3:XT=XX+((AA+HH)*(pos-1)):PROCorder(XT,YY,MO(K%))
820flag=FALSE:IF O%=1 THEN O=pos-1 ELSE O=5-pos
830IF MO(K%)=RR+O THEN flag=TRUE:PROCright(XT,50):GOTO860
840PROCwrong(XT,50)
850IF R%=1 THEN MT%(K%)=FALSE
860PROCdelay(500)
870ENDPROC
880:
890DEF PROCright(XR,YR):GCOL0,1:A=AA/10:B=BB/10
900FOR SO%=200 TO 250 STEP 5:SOUND1,1,SO%,1:NEXT
910IF R%=3 THEN ENDPROC
920PLOT4,XR+A,YR+3*B:PLOT4,XR+2*A,YR+4*B:PLOT85,XR+3*A,YR+B*3:
    PLOT4,XR+A,YR+3*
    B:PLOT85,XR+3*A,YR+B:PLOT4,XR+3*A,YR+B*3:PLOT85,XR+8*A,YR+B*7:
    PLOT4,XR+7*A,YR+8*
    B:PLOT85,XR+3*A,YR+B*3:ENDPROC
930DEF PROCwrong(XW,YW):GCOL0,1:A=AA/10:B=BB/10
940FOR SO%=60 TO 10 STEP -5:SOUND3,1,SO%,1:NEXT
950IF R%<>2 THEN ENDPROC
960PLOT4,XW+A,YW+2*B:PLOT4,XW+2*A,YW+B:PLOT85,XW+8
  *A,YW+7*B:PLOT4,XW+7*A,YW+8*
   B:PLOT85,XW+A,YW+2*B:PLOT4,XW+A,YW+7*B:PLOT4,XW+2*A,YW+B*8:
   PLOT85,XW+8*A,YW+2*B:
   PLOT4,XW+7*A,YW+B:PLOT85,XW+A,YW+7*B:ENDPROC
970:
980DEF PROCmixshape
990FOR I%=1 TO 5:P=RND(3)
1000IF P=1 THEN MO$(I%)="B" ELSE IF P=2 THEN MO$(I%)="T"
 ELSE MO$(I%)="S"
1010NEXT
1020ENDPROC
1030:
1040DEF PROCtriangle(xt,yt)
1050PLOT4,xt,yt:PLOT4,xt+48,yt:PLOT 85,xt+24,yt+48:ENDPROC
1060:
1070DEF PROCorder(xc,yc,nc):x=xc
1080IF Q%=1 THEN PROCorderand:GOTO1190
1090IF O%=1 THEN x=x+128
1100FOR II%=1 TO nc
1110IF MO$(K%)="B" THEN PROCbox(x+16,yc+64,x+64,yc+16)
1120IF MO$(K%)="T" THEN PROCtriangle(x+16,yc+16)
1130IF MO$(K%)="S" THEN PROCstar(x,yc)
1140IF O%=2 THEN x=x+64 ELSE x=x-64
1150IF II% MOD 3<>0 THEN 1180
1160IF O%=2 THEN x=xc ELSE x=xc+128
1170yc=yc+64
1180NEXT
1190ENDPROC
1200:
1210DEF PROCdouble(A$,K,L)
1220A%=&A:X%=0:Y%=&A:D=&A00
1230FORN=1 TO LEN(A$)
1240B$=MID$(A$,N,1)
1250?D=ASC(B$)
1260CALL (&FFF1)
1270VDU23,240,D?1,D?1,D?2,D?2,D?3,D?3,D?4,D?4
1280VDU23,241,D?5,D?5,D?6,D?6,D?7,D?7,D?8,D?8
1290MOVE K,L:PRINTCHR$(240);:VDU10:VDU8:PRINTCHR$(241);
1300NEXT N
1310ENDPROC
1320:
1330DEF PROCsort
1340flag=TRUE
1350FOR I=1 TO 4
1360IF MO(I)<MO(I+1) THEN 1420
1370flag=FALSE
1380t=MO(I):MO(I)=MO(I+1):MO(I+1)=t
1390IF Q%=2 THEN 1410
1400FORJ%=1TO9:t=MX(I,J%):MX(I,J%)=MX(I+1,J%):MX(I+1,J%)=t:t=MY
(I,J%):MY(I,J%)=
MY(I+1,J%):MY(I+1,J%)=t:NEXT
1410t$=MO$(I):MO$(I)=MO$(I+1):MO$(I+1)=t$
1420NEXT
1430IF flag=FALSE THEN 1340
1440ENDPROC
1450:
1460DEF PROCorderand
1470FOR II%=1 TO 9
1480IF MX(K%,II%)=0 THEN 1520
1490IF MO$(K%)="B" THEN PROCbox(xc+MX(K%,II%),yc+MY(K%,II%)+48,
 xc+MX(K%,II%)+48 ,yc+MY(K%,II%))
1500IF MO$(K%)="T" THEN PROCtriangle(xc+MX(K%,II%),yc+MY(K%,II%))
1510IF MO$(K%)="S" THEN PROCstar(xc+MX(K%,II%)-16,yc+MY(K%,II%)-16)
1520NEXT
1530ENDPROC
1540:
1550DEF PROCmix
1560FOR K%=1 TO 5
1570T(1)=RND(9)
1580FOR I%=1 TO MO(K%)
1590T=RND(9):flag=TRUE
1600FORJ%=1TOI%-1
1610IF T(J%)=T THEN flag=FALSE
1620NEXT
1630IF flag=FALSE THEN 1590
1640T(I%)=T
1650NEXT
1660FOR I%=1 TO 9:MX(K%,I%)=0:MY(K%,I%)=0:NEXT
1670FORI%=1 TO MO(K%)
1680MX(K%,T(I%))=XN(T(I%)):MY(K%,T(I%))=YN(T(I%))
1690NEXT:NEXT
1700ENDPROC
1710:
1720DEF PROCsetup
1730DIM MO(5),MO$(5),T(9),XN(9),YN(9),MX(5,9),MY(5,9),MT%(5)
1740YY=367:XX=39:AA=208:BB=208:HH=40:VV=120:YU=YY+BB+VV
1750ENVELOPE1,1,0,0,0,0,0,0,0,60,-10,0,-2,120,30
1760ENVELOPE 2,4,50,-15,-15,10,20,20,126,0,0,-126,126,126
1770FOR I%=1 TO 9:READ XN(I%),YN(I%):NEXT
1780DATA 16,16,80,16,144,16,16,80,80,80,144,80,16,144,80,144,144,144
1790PROCdefine
1800ENDPROC
1810:
```

```
 1820DEF PROCplcorder
 1830GCOL0,3:PLOT4,XX,YY+BB+10:PLOT4,XX+(5*AA)+(4*HH),YY+BB+10
 1840IF O%=1 THEN PLOT85,XX+(5*AA)+(4*HH),YY+BB+70 ELSE PLOT 85,XX,YY+BB+70
 1850GCOL0,1:PLOT5,XX,YY+BB+10:PLOT5,XX+(5*AA)+(4*HH),YY+BB+10:IF O%=1 THEN PLOT
5,XX+(5*AA)+(4*HH),YY+BB+70 ELSE PLOT 5,XX,YY+BB+70
 1860IF O%=1 THEN MOVEXX-8,YY+BB+48:PRINTCHR$(245)
 1870IF O%=2 THEN MOVEXX-8,YY+BB+104:PRINTCHR$(245)
 1880OO%=-1:ENDPROC
 1890:
 1900DEF PROCdefine
 1910VDU 23,245,28,28,73,62,8,20,34,34
 1920VDU 23,246,93,93,42,28,8,20,20,20
 1930ENDPROC
 1940:
 1950DEF PROCinit
 1960PROCsmalltitle(1)
 1970PRINT"  SHAPES REQUIRRD";TAB(23,2);"Boxes";TAB(38,2);"B";TAB(23,3);"Triangl
es";TAB(38,3);"T";TAB(23,4);"Stars";TAB(38,4);"S";TAB(23,5);"Mixture";TAB(38,5);
"M"
 1980PRINT'" ";CHR$129;"FEEDBACK REQUIRED";TAB(23,7);"Ticks only";TAB(38,7);"T";
TAB(22,8);CHR$129"Ticks and X's";TAB(38,8);"X";TAB(22,9);CHR$129"Sound only";TAB
(38,9);"S"
 1990PRINT'" ";CHR$131;"ORDER REQUIRED";TAB(23,11);"Ascending";TAB(38,11);"A";TA
B(22,12);CHR$131;"Descending";TAB(38,12);"D"
 2000PRINT'" ";CHR$133;"POSITION OF SHAPES";TAB(23,14);"Random";TAB(38,14);"R";T
AB(22,15);CHR$133;"Pattern";TAB(38,15);"P"
 2010PRINT'" ";CHR$134;"RANGE REQUIRED";TAB(23,17);"Random";TAB(38,17);"R";TAB(2
2,18);CHR$134;"Selected    1-5"
 2020PRINT'" ";CHR$130;"ELIMINATION REQUIRED";TAB(23,20);"Y or N";TAB(38,20);"?"
 2030PRINT'" ";CHR$132;"PICTURE REQUIRED";TAB(23,22);"Y or N";TAB(38,22);"?"
 2040PROCflash(0,2):PROCnoflash(22,2):FOR I=1TO4:PROCflash(37,1+I):NEXT
 2050T$=GET$
 2060IF T$="B" THEN S%=1 ELSE IF T$="T" THEN S%=2 ELSE IF T$="S" THEN S%=3 ELSE
IF T$="M" THEN S%=4 ELSE GOTO 2050
 2070PROCnoflash(0,2)::FOR I=1TO4:PROCnoflash(37,1+I):IF S%<>1 THEN PRINT " "; EL
SE PRINTCHR$(255);
 2080NEXT
 2090IF S%<>4 THEN FORI%=1TO5:MO$(I%)=T$:NEXT
 2100PROCflash(0,7):PROCnoflash(22,7):FOR I=1TO3:PROCflash(37,6+1):NEXT
 2110T$=GET$
 2120IFT$="T" THEN R%=1 ELSE IF T$="X" THEN R%=2 ELSE IF T$="S" THEN R%=3 ELSE G
OTO2110
 2130PROCnoflash(0,7):FOR I=1TO3:PROCnoflash(37,6+I):IF I<>R% THEN PRINT " "; ELS
E PRINTCHR$(255);
 2140NEXT
 2150PROCflash(0,11):PROCnoflash(22,11):PROCflash(37,11):PROCflash(37,12)
 2160T$=GET$
 2170IF T$="A" THEN O%=1 ELSE IF T$="D" THEN O%=2 ELSE GOTO2160
 2180PROCnoflash(0,11):PROCnoflash(37,11):IF O%<1 THEN PRINTCHR$(255); ELSE PRIN
T" ";
 2190PROCnoflash(37,12):IF O%=2 THEN PRINTCHR$(255); ELSE PRINT" ";
 2200PROCflash(0,14):PROCnoflash(22,14):PROCflash(37,14):PROCflash(37,15)
 2210T$=GET$
 2220IF T$="R" THEN Q%=1 ELSE IF T$="P" THEN Q%=2 ELSE GOTO 2210
 2230PROCnoflash(0,14):PROCnoflash(37,14):IF Q%=1 THEN PRINTCHR$(255); ELSE PRIN
T" ";
 2240PROCnoflash(37,15):IF Q%=2 THEN PRINTCHR$(255); ELSE PRINT" ";
 2250PROCflash(0,17):PROCnoflash(22,17):PROCflash(37,17):PROCflash(34,18)
 2260T$=GET$
 2270IF T$="R" THEN N%=1 ELSE IF ASC(T$)>48 AND ASC(T$)<54 THEN N%=2 ELSE GOTO22
50
 2280PROCnoflash(0,17):PROCnoflash(37,17);PRINT" ";:PROCnoflash(34,18):PRINT"
";:IF N%=1 THEN PRINT TAB(38,17);CHR$(255); ELSE PRINT TAB(38,18);T$;
 2290IF N%<>1 THEN RR=VAL(T$)
 2300PROCflash(0,20):PROCnoflash(22,20):PROCflash(37,20)
 2310T$=GET$:IF T$="Y" THEN E%=1 ELSE IF T$="N" THEN E%=2 ELSE GOTO2310
 2320PROCnoflash(0,20):PROCnoflash(37,20):PRINTTAB(38,20);T$;
 2330PROCflash(0,22):PROCnoflash(22,22):PROCflash(37,22)
 2340T$=GET$:IF T$="Y" THEN OO%=1 ELSE IF T$="N" THEN OO%=2 ELSE GOTO2340
 2350PROCnoflash(0,22):PROCnoflash(37,22):PRINTTAB(38,22);T$;
 2360VDU7:PROCflash(0,24):PROCanswer:IF X$="N" THEN 1960
 2370PROCinit1
 2380PROCenv:pass%=0
 2390ENDPROC
 2400:
 2410DEF PROCgetnum(lim%,gpos)
 2420XX$=""
 2430T$=GET$:IF ASC(T$)=127 AND LEN(XX$)=0 THEN2430
 2440IF ASC(T$)=13 AND LEN(XX$)=0 AND lim%<>20 THEN 2430
 2450IF ASC(T$)=13 THEN 2500
 2460IF ASC(T$)=127 THEN PRINTT$:XX$=LEFT$(XX$,LEN(XX$)-1):GOTO2430
 2470IF LEN(XX$)=2 THEN2430
 2480IF ASC(T$)<48 OR ASC(T$)>57 THEN 2430
 2490PRINTT$;:XX$=XX$+T$:GOTO2430
 2500gnum%=VAL(XX$):IF gnum%>lim% OR (gpos=3 AND gnum%=0) THEN VDU7:VDU31,36,gpo
s:PRINT"   ";:VDU31,36,gpos:GOTO 2420
 2510IF gnum%=0 AND lim%=20 THEN XX$="R"
 2520IF LEN(XX$)=1 THEN VDU 31,36,gpos:PRINT"  ";XX$;" ":ENDPROC
 2530IF LEN(XX$)=2 THEN VDU 31,36,gpos:PRINT" ";XX$;" ":ENDPROC
 2540:
 2550DEF PROCflash(hpos,vpos)
 2560VDU31,hpos,vpos:PRINTCHR$(136);
 2570ENDPROC
 2580:
 2590DEF PROCnoflash(hpos,vpos)
 2600VDU31,hpos,vpos:PRINTCHR$(137);
 2610ENDPROC
 2620:
 2630DEF PROCoutline(ox1,oy1,ox2,oy2)
 2640PLOT4,ox1,oy1:PLOT5,ox2,ov1:PLOT5,ox2,oy2:PLOT5,ox1,oy2:PLOT5,ox1,oy1:ENDPR
OC
 2650:
 2660DEF PROCrub
 2670XT=XX+((AA+HH)*(K%-1))
 2680IF E%=2 THEN VDU19,0,7,0,0,0:GCOL0,3:PROCorder(XT,YU,MO(K%)):PROCoutline(XT
,YU,XT+208,YU+208)
 2690IF E%=1 THEN GCOL0,1:PROCbox(XT,YU+BB,XT+AA,YU):GCOL0,3:PROCoutline(XT,YU+B
B,XT+AA,YU)
 2700GCOL0,1:XT=XX+((AA+HH)*(pos-1)):PROCbox(XT,YY+BB,XT+AA,YY):GCOL0,3:PROCout1
ine(XT,YY+BB,XT+AA,YY)
 2710GCOL0,2:PROCbox(XT,35+BB,XT+AA,35):ENDPROC
 2720:
 2730DEF PROCster(sx,sy)
 2740PLOT4,sx+24,sy+56:PLOT5,sx+56,sy+24:PLOT4,sx+24,sy+24:PLOT5,sx+56,sy+56:PLO
T4,sx+40,sy+64:PLOT1,0,-48:PLOT4,sx+16,sy+40:PLOT1,48,0:ENDPROC
 2750:
 2760DEF PROCinit1
 2770PROCsmalltitle(2)
 2780PRINT'" ";CHR$134;"TIME DELAY IN SECS";TAB(23,3);"(max 60)";TAB(39,3);"?"'"
";CHR$131;"NUMBER OF QUESTIONS";TAB(23,5);"(max 20)";TAB(39,5);"?"'" ";CHR$(129
);"SOUND LEVEL";TAB(23,7);"(0,1,2)";TAB(39,7);"?"
 2790PROCflash(0,3):PROCnoflash(22,3):PROCflash(38,3):VDU31,36,3:PROCgetnum(60,3
):PROCnoflash(0,3):del=gnum%
 2800PROCflash(0,5):PROCnoflash(22,5):PROCflash(38,5):VDU31,36,5:PROCgetnum(20,5
):PROCnoflash(0,5)
 2810IF gnum%=0 THEN nq%=-1 ELSE nq%=gnum%
 2820PROCflash(0,7):PROCnoflash(22,7):PROCflash(38,7):VDU31,36,7:PROCgetnum(2,7)
:PROCnoflash(0,7)
 2830m1=gnum%/2
 2840VDU7:PROCflash(0,9):PROCanswer:IF X$="N" THEN 2770
 2850ENDPROC
 2860:
 2870DEF PROCanswer
 2880PRINT" Selection O.K.        Y or N          ?";:REPEAT:X$=GET$:UNTIL X$="Y"
OR X$="N":ENDPROC
 2890:
 2900DEF PROCsmalltitle(nsel%)
 2910CLS:PRINTTAB(8,0)CHR$130;"SELECTION PAGE  PART ";nsel%;TAB(8,1);CHR$146;"/
//////////////////////":ENDPROC
 2920:
 2930DEF PROCsetup1
 2940IF OO%=-1 THEN OO%=1
 2950VDU19,2,2,0,0,0
 2960CLS:GCOL0,130:CLG:GCOL0,1
 2970VDU23;11,0;0;0;0
 2980VDU5
 2990PROCrandom
 3000PROCoptions
 3010pos=1
 3020VDU19,3,2,0,0,0:VDU19,1,2,0,0,0:PROClayout
 3030ENDPROC
 3040:
 3050DEF PROCcorrect:XT=XX
 3060PROCsort
 3070IF O%=1 THEN rr=RR ELSE rr=RR+4
 3080IF O%=1 THEN J%=1 ELSE J%=5
 3090IF O%=1 THEN t=1 ELSE t=-1
 3100IF O%=1 THEN man1%=48:man2%=56
 3110IF O%=2 THEN man1%=104:man2%=96
 3120FOR I=4 TO 36 STEP 8
 3130IF O%=1 THEN K%=J% ELSE K%=6-J%
 3140GCOL0,0:PROCorder(XT,YY,MO(J%)):PROCoutline(XT,YY,XT+208,YY+208)
 3150T$=CHR$(48+rr):SOUND1,-14*m1,100,6
 3160PROCdouble(T$,XT+76,YY-62)
 3170XT=XT+AA+HH
 3180IF K%=1 AND OO%=-1 THEN GCOL0,2:MOVE XX-8,YY+BB+man1%:PRINTCHR$245:GCOL0,1:
MOVE XX+148,YY+BB+man2%:PRINTCHR$245
 3190IF K%>1 AND OO%=-1 THEN GCOL0,2:MOVE XX+148+(K%-2)*(AA+HH),YY+BB+man2%+(K%-
2)*12*t:PRINTCHR$245:GCOL0,1:MOVE XX+148+(K%-1)*(AA+HH),YY+BB+man2%+(K%-1)*12*t:
PRINTCHR$245
 3200J%=J%+t
 3210rr=rr+t:PROCdelay(300)
 3220NEXT
 3230IF OO%=-1 THEN PROCflashman
 3240IF nq%<>-1 THEN pass%=pass%+1
 3250ENDPROC
 3260:
 3270DEF PROCputinorder
 3280PROCplot:PROCarrow(pos,1):PROCwhitarr:VDU19,3,7,0,0,0:VDU19,1,1,0,0,0
 3290FORI%=1TO5:MT%(I%)=TRUE:NEXT
 3300IF OO%=1 THEN PROCplcorder
 3310PROCselect
 3320IF flag=FALSE THEN PROCrub:GOTO 3310
 3330pos=pos+1
 3340GCOL0,3:XT=XX+((AA+HH)*(K%-1)):PROCorder(XT,YU,MO(K%)):PROCoutline(XT,YU,XT
+208,YU+208):PROCarrow(pos-1,2)
 3350IFpos<=5 THEN 3280
 3360ENDPROC
 3370:
 3380DEF PROCoptions
 3390IF S%=4 THEN PROCmixshape
 3400IF O%=1 THEN PROCmix
 3410ENDPROC
 3420:
 3430DEF PROCflashman
 3440SOUND1,2,100,210
 3450xm%=XX+148+4*(AA+HH):ym%=YY+BB+man2%+48*t
 3460FOR I%=1 TO 10
 3470GCOL0,1:MOVExm%,ym%:PRINTCHR$245:PROCdelay(50)
 3480GCOL0,2:MOVExm%,ym%:PRINTCHR$245:GCOL0,1:MOVExm%,ym%+8:PRINTCHR$246:PROCdel
ay(50)
 3490GCOL0,2:MOVExm%,ym%+8:PRINTCHR$246:NEXT
 3500GCOL0,1:MOVExm%,ym%:PRINTCHR$245:ENDPROC
 3510:
 3520DEF PROCmoveon
 3530flag=TRUE
 3540*FX15,1
 3550a=ASC(GET$)
 3560IF a=27 THEN flag=FALSE:ENDPROC
 3570IF a=32 THEN ENDPROC ELSE 3550
 3580:
 3590DEF PROCenv
 3600ENVELOPE1,1,0,0,0,0,0,0,60,-10,0,-2,120*m1,30*m1
 3610ENVELOPE2,4,50,-15,-15,10,20,20,126,0,0,-126,126*m1,126*m1
 3620ENDPROC
 3630:
 3640DEF PROCfront
 3650VDU23;11,0;0;0;0
 3660*FX4,1
 3670*KEY10OLD|MRUN|M
 3680*FX229,1
 3690PRINTTAB(15,10);CHR$134;CHR$141;"ORDER.";TAB(15,11);CHR$134;CHR$141;"ORDER.
";TAB(18,13);CHR$134;"by";TAB(11,15);CHR$134;"J.C.O'Callaghan."
 3700PROCdelay(300):ENDPROC
```

QL Mailmerge

by M Cockerill

This simple mailmerge program takes data from Archive and incorporates it into Quill text files. To use the program, create a document in Quill in the normal way, but when you want to include a field from Archive, mark it by typing in the field name enclosed in hash marks (#). Then, instead of saving the document, print it to a microdrive file.

Export a file from Archive containing all the fields to be used in the document and, finally, run the mailmerge program. It will print out

a series of documents, each using data from a different record from the Archive file. Remember that the length of the field will affect justification; also remember that the program uses export and print files, not database or document files.

```
100 REMark ******************mail merge******************
110 CLS
120 OPEN #6,ser1
130 INPUT "Name of QUILL print file ?";qf$
140 IF qf$(1 TO 3)<>"mdv" THEN qf$="mdv1_"&qf$
150 INPUT "Name of ARCHIVE export file ?";af$
160 IF af$(1 TO 3)<>"mdv" THEN af$="mdv1_"&af$
170 PRINT "Loading text file"
180 x$="":REMark will hold the text of the document
190 fnum=1
200 OPEN_IN #5,qf$
210 INPUT #5,dud$:REMark header inf not needed
220 REMark rather inefficient method is used due to ROM bug
230 REPeat input_data
240   x$=x$&INKEY$(#5)
250   IF EOF(#5) THEN EXIT input data
260 END REPeat input_data
270 CLOSE #5
280 PRINT "Merging data"
290 DIM field$(40,20):REMark enough for most purposes
300 OPEN_IN #5,af$
310 REPeat input_keys
320   field$(fnum)=fileinput$
330   fnum=fnum+1
340   IF last THEN EXIT input keys
350 END REPeat input_keys
360 fnum=fnum-1:REMark last one isn't a field
370 REMark make search keys
380 DIM key$(fnum,20)
390 FOR key = 1 TO fnum
400   key$(key)="#"&field$(key)&"#"
410 END FOR key
420 REMark find the keys
430 REPeat all_records
440   print$=x$
450   FOR search= 1 TO fnum
460     text$=fileinput$
470     REPeat check
480       pos=key$(search) INSTR print$
490       IF pos=0 THEN EXIT check
500       print$=print$(1 TO pos-1)&text$&print$((pos+LEN
          (key$(search))) TO)
510     END REPeat check
520   NEXT search
530   PRINT #6,print$
540   IF EOF(#5) THEN EXIT all_records
550 END REPeat all_records
1000 REMark
1010 REMark ********FUNCTION RETURNING ONE ENTRY
     FROM ARCHIVE FILE********
1020 REMark
1030 DEFine FuNction fileinput$
1040 REMark 2 lines to ignore the quotation marks ARCHIVE
     sends with strings
1050 q$=INKEY$(#5)
1060 IF q$=CHR$(26) THEN STOP
1070 IF q$='"' THEN q$="":numeric=0:ELSE numeric=1
1080 REPeat inp
1090   z$=INKEY$(#5)
1100   IF z$='"' OR numeric AND z$="," THEN
1110     IF INKEY$(#5)=CHR$(10) THEN last=1:RETurn
         q$:ELSE last=0:RETurn q$
1120     END IF
1130   END IF
1140   q$=q$&z$
1150 END REPeat inp
1160 RETurn q$
1170 END DEFine
```

Atari 520ST Graphics

by D Harvey & P Lake

Atari Personal Basic on the 520ST makes extensive use of windows, and can display high-resolution graphics pictures created elsewhere. If interaction is required a window is drawn, spoiling the picture. A set of graphics routines (VDI) similar to GSX graphics can be called from Basic; these can access the whole of the screen, including windows. This program makes use of the VDI input/output facilities, and INP(2) is the input statement to receive a character from the keyboard. After initialisation, VDISYS(1) is utilised to transfer the characters to the required screen position without drawing a window box.

After the VDI POKEs in lines 1000-1040 have been initialised, the character size may be changed. The additional subroutine to provide the variable character is:

```
2000 POKE contrl,12:POKE contrl+2,1:POKE ptsin,0
20005 POKE ptsin+2,variable
2010 VDISYS(1):RETURN
```

The default variable value is 13 and should be entered through VDI before finishing, otherwise editing may be affected. For smaller characters, the variable may be set to four or six; for larger characters, to 25 or something similar.

```
10    REM obtain a string variable not exceeding ten chars.
20    xpos=528:ypos=280:GOSUB 1090:GOSUB 1000
30    a$="":FOR x=1 TO i:IF a(x)=95 THEN a(x)=32
40    a$=a$+chr$(a(x)):NEXT x:END
1000  FOR i=1 TO 10
1010  a(i)=INP(2):IF a(i)=32 THEN a(i)=95:REM trap space
1020  IF a(i)=8 OR a(i)=127 OR a(i)=203 THEN i=i-2:
      GOSUB 1160:i=i+1:a(i)=32
1030  IF i<1 THEN i=1
1040  IF a(i)=13 THEN 1080
1060  IF a(i)<46 OR a(i)>123 THEN 1010 ELSE GOSUB 1150
1070  NEXT i:i=10
1080  RETURN
1090  REM  initialisation
1100  COLOR 1,1,1,1,1
1110  POKE contrl,8 : REM required for character display
1120  POKE contrl+2,1:REM required for character display
1130  POKE contrl+6,11:REM 11 character positions required
1140  POKE ptsin,xpos:POKE ptsin+2,ypos:RETURN
1150  REM  vdi output character routine
1160  FOR  x=1 TO i  :POKE intin+2*x,a(x):NEXT x
1170  FOR x=i+1 TO 11:POKE intin+2*x,32:NEXT x
1180  VDISYS(1):RETURN
```

Epson HX-20 HX-Buff

by P Milewski

This short program is designed to allow the HX-20 with 16k expansion to be used as a 27k printer buffer for another computer. The RS232 parameters for the host computer (X$) and printer (Y$) are given in

line 40.

When the program has been saved, it can be run. The machine code section will load in and the loader section will delete itself; type in CLEAR 300,n where n is the size of RAM you want to use. (It is safer to select approximately 27000 rather than the maximum.)

To use the program, connect the distant computer and Run. Press PF2 to clear the RAM file. Make sure that the ready signal is on the LCD before anything is sent from the host computer, then use the host computer as if it were connected to a serial printer that is switched on. As soon as the HX-20 receives any input, a telephone sign will appear on the LCD. If the RAM file fills up, an XOFF signal will be transmitted and you will be given the option of printing, clearing or finishing. To print, connect the HX-20 to a printer, run the program again and press PF1.

Other functions are: PF4 to set up function keys to load other programs through the RS232 port; and PF5 to end the program.

```
 10 '*******
 20 'HX-BUFF
 30 '*******
 40 WIDTH20,12:CLEAR600:X$="(68N1F)":Y$="(68N13)":GOTO220
 50 '***SUBS***
 60 'Loadm if nec.
 70 IFPEEK(2633)=128 AND PEEK(2634)=0 THEN RETURN
 80 SOUND10,5:GOTO570
 90 'Open#
100 OPEN"I",1,"COM0:"+X$:OPEN"O",2,"COM0:"+X$:RETURN
110 'Ramfile size trap
120 PRINT"  *RAMfile FULL!*":SOUND10,5
130 PRINT"  Any key to cont":B=INPUT$(1)
140 PRINT"1-Print 2-End":PRINT"3-Clear";:Z=VAL(INPUT$(1))
150 IFZ ANDZ<4 THENONZ GOTO350,490,420
160 GOTO140
170 'Keys
180 KEY1,"WIND":KEY2,"LIST":KEY3,"STAT"+CHR$(13):KEY5,"LOGIN"
190 KEY4,"STATALL"+CHR$(13):KEY6,"SCREEN":KEY7,"GOTO":RETURN
200 '*****************
210 'Initialize
220 FORI=1TO7:KEYI,"":NEXT:POKE&H16E,0
230 SCREEN0:CLS:WIDTH"COM0:",255:POKE361,0
240 DEFUSR4 =2628:DEFSTRA,B:DEFINTC-Z
250 GOSUB70:SCROLL9,0
260 ONERRORGOTO520
270 GOSUB100:CLS
280 PRINT"Ready..."
290 '*****************
300 'Chat
310 A="":POKE125,4:CHAR=USR4(CHAR):POKE125,0:J=PEEK(&H16E)
320 POKE&H16E,0:ONJ-240GOTO350,420,310,440,490,310,310,310,310,310,120
330 '*****************
340 'PF1 RAM transfer
350 CLS:PRINT"*TRANSMIT*> RS232*..";:CLOSE:OPEN"O",2,"COM0:"+Y$
360 IFCHAR<255 THENZ=CHAR ELSEZ=255
370 DEFFILZ,O:Y=CHAR:I=0
380 IFY<Z THENDEFFILY,Z*1:X=Z*1+Y:GET%0,A:PRINT#2,A;:GOTO400
390 GET%1,A:PRINT#2,A;:I=I+1:Y=Y-Z:GOTO380
400 PRINT"*"+STR$(X)+" BYTES SENT*":GOTO280
410 'PF2 Clear RAM
420 CLS:PRINT"Clear RAM:":INPUT"Are you sure";A:IFA$<>"Y"THENCLS:GOTO280
430 EXEC2797:PRINT"RAM Cleared":GOTO280
440 'PF4 Program load
450 KEY5,"LOGIN":KEY6,"CLOSE"+CHR$(13)+"MERGE"+CHR$(34)+"COM"
460 KEY7,"O:(68N1F)"+CHR$(34)+CHR$(13)
470 PRINT"PF6-7 for LOADing..":PRINT"NB LOGIN!":END
480 'PF5 Finish
490 CLS:PRINTCHAR;"Bytes in RAM":GOSUB180:END
500 '*****************
510 'Error routine
520 SOUND10,5:PRINT"Error"+STR$(ERR)+" in"+STR$(ERL)
530 PRINT#2,CHR$(19);:PRINT"Any key to cont":B=INPUT$(1)
540 CLS:RESUME58
550 '*****************
560 'Hexloader
570 TITLE"HX-BUFF":RESTORE680:READN$,A%,B%
580 PRINT"Program    ";N$;:IFPOS(0) THENPRINT
590 PRINT"Start ";HEX$(A%);" End ";HEX$(B%)
600 PRINT"=";B%-A%+1;"bytes of data"
610 IFPEEK(&H500)*256+PEEK(&H501)<=B%THENPRINT"MEMSET reset to";B%+1;:
MEMSETB%+1:RESTORE680:READN$,A%,B%
620 PRINT"Hex loading now..":D=CSRLIN
630 FORI=A%TO B%:READC:POKE!,C:NEXT 'Loading
640 SOUND20,7:LOCATE0,D-1:PRINT"Loading complete.";:DELETE570-
650 '******* *******
660 'DATA statements start here:
670 '*****************
680 DATABUFFHEX,2624,2810
690 DATA0,127,56,1,60,127,10,64,206,128,0,9,230,0,193,32,38,7,188,5
700 DATA162,43,2,32,242,8,140,128,0,42,5,255,10,65,32,3,126,10,230,254
710 DATA1,194,39,7,140,0,120,44,17,32,28,246,10,67,39,23,127,10,67,134
720 DATA17,189,255,118,32,13,246,10,67,46,8,124,10,67,134,19,189,255,118,189
730 DATA255,157,129,0,39,17,189,255,154,129,254,38,3,126,10,193,189,255,118,196
740 DATA3,38,249,189,255,121,196,1,38,185,254,10,65,167,0,8,140,128,0,42
750 DATA45,255,10,65,141,21,126,10,103,134,19,189,255,118,124,10,67,56,252,10
760 DATA65,179,5,162,237,2,57,246,10,64,39,1,57,124,10,64,95,189,255,73
770 DATA134,150,189,255,79,57,198,251,247,1,110,32,212,254,5,162,198,32,231,0
780 DATA8,140,128,0,43,248,57
```

Spectrum Datagraph

by Alec Goodyear

This program can store sets of data, scientific or business, and then print a line graph, histogram or pie chart to either screen or printer. It can hold up to 15 sets of data at once, with each set of data holding up to 15 items. The graphs it produces are of a very high quality.

A little experimentation with the program will show how it works.

```
 10 REM ******************
 20 REM *  DATA GRAPH    *
 30 REM *                *
 40 REM *       BY       *
 50 REM *                *
 60 REM * ALEC GOODYEAR  *
 70 REM *                *
 80 REM * OCTOBER 1985   *
 90 REM ******************
100 REM
110 POKE 23658,8
120 DIM D(15,15): DIM C(15,2): DIM L(15): DIM T$(15,15):
    DIM D$(15,15,10)
130 LET S=0
140 INK 0: PAPER 4: BRIGHT 1: BORDER 1: CLS
150 PRINT AT 19,0;
160 FOR N=1 TO 96
170 PRINT  PAPER 5;" ";
180 NEXT N
190 REM ************
200 REM *MAIN MENU*
210 REM ************
220 GO SUB 1740
230 GO SUB 1770
240 GO SUB 2210
250 PRINT AT 6,7;"(1) ADD/DELETE DATA";AT 8,7;"(2)
    HISTOGRAM";AT 10,7;"(3) LINE
GRAPH";AT 12,7;"(4) PIE CHART";AT 14,7;"(5) QUIT"
260 GO SUB 1820
270 LET K$=INKEY$: IF K$="" THEN  GO TO 270
280 LET K=CODE K$
290 IF K<49 OR K>53 THEN  GO TO 270
300 BEEP .1,16
310 GO SUB 1770
320 IF K=49 THEN  GO SUB 370: GO TO 230
330 IF K=50 THEN  GO SUB 850: GO TO 230
340 IF K=51 THEN  GO SUB 1120: GO TO 230
350 IF K=52 THEN  GO SUB 1370: GO TO 230
360 IF K=53 THEN  GO TO 2230: GO TO 230
370 REM ******************
380 REM *ADD/DELETE DATA*
390 REM ******************
400 GO SUB 1870
410 PRINT AT 6,8;"(1) ADD DATA";AT 8,8;"(2) DELETE DATA"
420 GO SUB 1820
430 LET K$=INKEY$: IF K$="" THEN  GO TO 430
440 LET K=CODE K$
450 IF K<49 OR K>50 THEN  GO TO 430
460 BEEP .1,16
470 GO SUB 1770
480 IF K=50 THEN  GO TO 770
490 IF S=15 THEN  GO SUB 1840: RETURN
500 LET S=S+1
510 GO SUB 1870
520 PRINT AT 6,8;"Please enter the";AT 8,9;"title of this";AT
    10,10;"set of data.";AT 12,7;"(MAX 15 CHARACTERS)"
530 INPUT I$: IF LEN I$>15 THEN  BEEP .5,0: GO TO 530
540 LET T$(S)=I$
550 GO SUB 1770
560 PRINT AT 1,2;"DATA SET : ";S;AT 2,2;"TITLE : ";T$(S)
570 PRINT AT 18,1;"Please enter data or XX to end"
580 LET C=1
```

```
 590 IF C=15 THEN  PRINT AT 18,1;"                                "
 600 PRINT AT C+3,2;C
 610 PRINT AT 20,2; PAPER 5;"Enter group. (MAX 10 CHARS)  "
 620 INPUT I$: IF LEN I$>10 THEN  BEEP .5,0: GO TO 620
 630 IF I$="XX" AND C=1 THEN  LET S=S-1: RETURN
 640 IF I$="XX" THEN  GO TO 730
 650 PRINT AT C+3,7;I$
 660 LET D$(S,C)=I$
 670 PRINT AT 20,2; PAPER 5;"Enter amount.                "
 680 INPUT I
 690 PRINT AT C+3,22;I
 700 LET D(S,C)=I
 710 LET C=C+1
 720 IF C<>16 THEN  GO TO 590
 730 LET L(S)=C-1
 740 BEEP .5,10
 750 GO SUB 1660
 760 RETURN
 770 IF S=0 THEN  GO SUB 1890: RETURN
 780 GO SUB 1870
 790 PRINT AT 6,8;"Are you sure you";AT 8,7;"want all the data"
;AT 10,6;"to be deleted (Y/N) ?"
 800 LET K$=INKEY$: IF K$="" THEN  GO TO 800
 810 BEEP .1,16
 820 IF K$<>"Y" AND K$<>"y" THEN  RETURN
 830 LET S=0
 840 RETURN
 850 REM ***********
 860 REM *HISTOGRAM*
 870 REM ***********
 880 GO SUB 1970
 890 IF S=0 THEN  GO SUB 1890: RETURN
 900 IF S=1 THEN  LET T=1: GO TO 940
 910 GO SUB 1920
 920 GO SUB 1770
 930 GO SUB 1970
 940 GO SUB 2090
 950 GO SUB 2120
 960 FOR N=1 TO L(T)
 970 GO SUB 2170
 980 PRINT AT 17,N+1;CHR$ (N+64)
 990 LET P=INT ((80/C(T,1))*D(T,N)+48)
1000 FOR M=48 TO P
1010 PLOT N*8+9,M: DRAW 6,0: DRAW 3,3
1020 NEXT M
1030 FOR M=P+1 TO P+3
1040 PLOT N*8+M-P+9,M: DRAW 5,0
1050 NEXT M
1060 INVERSE 1
1070 PLOT N*8+8,48: DRAW 0,P-49: DRAW 4,4: DRAW 8,0: DRAW -5,-5:
   DRAW -6,0: DRAW  6,0: DRAW 0,50-P
1080 INVERSE 0
1090 NEXT N
1100 GO SUB 2030
1110 RETURN
1120 REM ************
1130 REM *LINE GRAPH*
1140 REM ************
1150 GO SUB 2010
1160 IF S=0 THEN  GO SUB 1890: RETURN
1170 IF S=1 THEN  LET T=1: GO TO 1210
1180 GO SUB 1920
1190 GO SUB 1770
1200 GO SUB 2010
1210 GO SUB 2090
1220 GO SUB 2120
1230 LET P=INT ((80/C(T,1))*D(T,1))
1240 LET N=1
1250 GO SUB 2170
1260 PRINT AT 17,2;"A"
1270 PLOT 20,P+48
1280 FOR N=2 TO L(T)
1290 GO SUB 2170
1300 PRINT AT 17,N+1;CHR$ (N+64)
1310 LET Q=P
1320 LET P=INT ((80/C(T,1))*D(T,N))
1330 DRAW 8,P-Q
1340 NEXT N
1350 GO SUB 2030
1360 RETURN
1370 REM ***********
1380 REM *PIE CHART*
1390 REM ***********
1400 GO SUB 2190
1410 IF S=0 THEN  GO SUB 1890: RETURN
1420 IF S=1 THEN  LET T=1: GO TO 1460
1430 GO SUB 1920
1440 GO SUB 1770
1450 GO SUB 2190
1460 GO SUB 2090
1470 LET A2=0
1480 CIRCLE 67,85,40
1490 LET D=2*PI/C(T,2)
1500 FOR N=1 TO L(T)
1510 LET A=D(T,N)*D
1520 LET A2=A2+A
1530 LET X=SIN (A2)*40
1540 LET Y=COS (A2)*40
1550 GO SUB 2170
1560 PLOT 67,85: DRAW X,Y
1570 LET X2=8+6*SIN (A2-A/2)
1580 LET Y2=11-6*COS (A2-A/2)
1590 PRINT AT Y2,X2;CHR$ (N+64)
1600 NEXT N
1610 GO SUB 2030
1620 RETURN
1630 REM ************
1640 REM *SUBROUTINES*
1650 REM ************
1660 LET MAX=0: LET C(S,2)=0
1670 FOR N=1 TO L(S)
1680 IF D(S,N)>MAX THEN  LET MAX=INT (D(S,N))
1690 LET C(S,2)=C(S,2)+D(S,N)
1700 NEXT N
1710 LET C(S,1)=MAX
1720 RETURN
1730 STOP
1740 PLOT 0,175: DRAW 255,0: DRAW 0,-175: DRAW -255,0: DRAW 0,
     174: DRAW 254,0: DRAW 0,-173: DRAW -253,0: DRAW 0,172
1750 PLOT 2,23: DRAW 251,0: PLOT 2,22: DRAW 251,0
1760 RETURN
1770 FOR N=1 TO 18
1780 PRINT AT N,1;"                                "
1790 NEXT N
1800 PRINT AT 20,1; PAPER 5;"                                "
1810 RETURN
1820 PRINT AT 20,6; PAPER 5;"PLEASE CHOOSE OPTION"
1830 RETURN
1840 PRINT AT 6,10;"NO ROOM FOR";AT 8,10;"FURTHER DATA"
1850 BEEP 1,0
1860 RETURN
1870 PRINT AT 1,8;"ADD/DELETE DATA";AT 2,8 ;"---------------"
1880 RETURN
1890 PRINT AT 6,10;"THERE IS NO";AT 8,10;"DATA PRESENT"
1900 BEEP 1,0
1910 RETURN
1920 PRINT AT 6,7;"Please enter data";AT 8,8;"set to be used.";AT
     20,2; PAPER 5;  "SETS USED ARE ( 1 - ";S;" )"
1930 INPUT I
1940 IF I<1 OR I>S THEN  GO TO 1930
1950 LET T=I
1960 RETURN
1970 PRINT AT 1,11;"HISTOGRAM";AT 2,11;"---------"
1980 RETURN
1990 PLOT 145,151: DRAW 0,-127: PLOT 146,151: DRAW 0,-127
2000 RETURN
2010 PRINT AT 1,11;"LINE GRAPH";AT 2,11;"----------"
2020 RETURN
2030 PRINT AT 20,4; PAPER 5;"C-Copy , ENTER-Continue"
2040 LET K$=INKEY$: IF K$="" THEN  GO TO 2040
2050 IF K$="C" OR K$="c" THEN  BEEP .1,16: PRINT AT 20,4; PAPER 5;"
          ": COPY : GO TO 2030
2060 IF K$=CHR$ 13 THEN  BEEP .5,10
2070 RETURN
2080 GO SUB 2040
2090 GO SUB 1990
2100 PRINT AT 3,23;"KEY";AT 3,23; OVER 1;"___";AT 4,2;T$(T)
2110 RETURN
2120 PLOT 14,127: DRAW 0,-81: DRAW 121,0: DRAW 0,1: DRAW -120,0:
     DRAW 0,80
2130 FOR N=56 TO 120 STEP 8
2140 PLOT 12,N: PLOT 13,N
2150 NEXT N
2160 RETURN
2170 PRINT AT N+3,19;CHR$ (N+64);"-";D$(T,N)
2180 RETURN
2190 PRINT AT 1,11;"PIE CHART";AT 2,11;"---------"
2200 RETURN
2210  PRINT AT 3,6;"D A T A   G R A P H";AT 4,6;"----------------"
2220 RETURN
2230 REM ******
2240 REM *QUIT*
2250 REM ******
2260 GO SUB 2210
2270 PRINT AT 6,6;"Type RUN if you want";AT 8,5;"to re-use
     the program."
2280 STOP
```

Pittsburgh Phil

by K Riordan

MICROTEX 666

This program is available electronically through Microtex 666's software downloading service. It is accessed through Viatel page *66637#.

The Wizard of Odds program, November 1985 *APC*, resulted in an enthusiastic stir from many readers. So Kevin Riordan has put digit to keyboard and come up with another 'sport of kings' masterpiece. Full instructions are in the listing. Good punting!

```
1000 REM ************************************************************
1001 REM **                                                        **
1002 REM **                  "PITTSBURGH PHIL"                     **
1003 REM **                                                        **
1004 REM **        A THOROUGHBRED RACING FORM STORAGE              **
1005 REM **      AND RETRIEVAL SYSTEM WRITTEN FOR                  **
1006 REM **              COMMODORE 64                              **
1007 REM **                                                        **
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1008 REM **                  (KEVIN RIORDAN 1986)                  **
1009 REM **                                                        **
1010 REM ************************************************************
1011 :
1012 REM  AS AN ADJUNCT TO MY  'WIZARD OF ODDS' ROUTINE  (NOVEMBER 1985) I HAVE
1013 REM     DEVISED THIS PROGRAM,  NAMED FOR THE FAMOUS AMERICAN HORSE-PLAYER,
1014 REM     TO ENABLE USERS TO MAINTAIN THEIR OWN DATA BASES ON DISK.
1015 :
1016 REM  ALTHOUGH THE USER  MUST BE PREPARED TO DEDICATE  SEVERAL HOURS WEEKLY
1017 REM     TO THE MAINTENANCE OF THE DATA BASE,  THE ADVANTAGES ARE MANIFOLD.
1018 REM     SPECIFICALLY,  AS THE  DATA  BASE  GROWS,  THE RATINGS  RECORDS OF
1019 REM     INDIVIDUAL THOROUGHBREDS  WILL TEND  TO DISCLOSE  THEIR PARTICULAR
1020 REM     TRACK  PREFERENCES  AND THEIR ABILITY  TO HANDLE  DIFFERING  TRACK
1021 REM     CONDITIONS.
1022 :
1023 REM  A HORSE, FOR EXAMPLE,  THAT RACES BETTER AT A "TIGHT" TRACK WILL RATE
1024 REM     MORE  HIGHLY  AT SUCH TRACKS AS  WARWICK FARM  AND  MOONEE VALLEY,
1025 REM     WHILE ANOTHER  INCLINED TO PREFER MORE GALLOPING ROOM WILL ACHIEVE
1026 REM     HIGHER RATINGS AT TRACKS LIKE RANDWICK AND FLEMINGTON.
1027 :
1028 REM  SIMILARLY,  THE  PREFERENCE  OF  A  HORSE  FOR A  PARTICULAR  TRACK
1029 REM     CONDITION WILL TEND TO BE REFLECTED IN ITS RATINGS.  WE MAY EXPECT
1030 REM     AN OUT-AND-OUT MUDRUNNER  TO RATE MORE HIGHLY,  FOR EXAMPLE,  WHEN
1031 REM     THE OFFICIAL TRACK DESCRIPTION IS WORSE THAN 'DEAD', WHILE RATINGS
1032 REM     OF OTHER BETTER-PERFORMED GALLOPERS MAY SUFFER IN SUCH CONDITIONS.
1033 :
1034 REM  THE USER SHOULD THEREFORE BE ABLE  TO ISOLATE A HORSE'S PEAK PERFORM-
1035 REM     ANCE QUITE EASILY AND FEED THAT PERFORMANCE TO 'WIZARD OF ODDS' TO
1036 REM     OBTAIN A  MORE ACCURATE  ASSESSMENT  OF THE ANIMAL'S  CHANCE IN AN
1037 REM     UPCOMING RACE.      HE/SHE WILL ALSO BE ABLE TO SPOT IMPROVERS AND
1038 REM     DECLINERS MUCH MORE READILY.
1039 :
1040 REM  THE PROGRAM  IS IN TWO PARTS.   PART 1 COMPRISES A MACHINE CODE FILE
1041 REM     GENERATOR WHICH IS EXECUTED  ONLY WHEN THE FILE WHICH IT GENERATES
1042 REM     IS FOUND  TO BE ABSENT  FROM THE  PROGRAM DISK.   THE MACHINE CODE
1043 REM     FILE IS CALLED 'PPCODE'.  PART 2 EMBODIES THE MAIN PROGRAM.
1044 :
1045 REM  SINCE THE PROGRAM HAS THE POTENTIAL TO DESTROY A DISK'S CONTENTS,  IT
1046 REM     IS ADVISABLE  TO SAFEGUARD IT WITH A WRITE-PROTECT STICKER.    THE
1047 REM     USER IS ALSO WARNED THAT ANY DISK FORMATTED BY THE PROGRAM FOR ITS
1048 REM     DATA FILES WILL LOSE ANY INFORMATION RECORDED ON IT.  THEREFORE IT
1049 REM     IS ADVISABLE TO USE ONLY FRESH DISKS FOR DATA FILES.
1050 :
1051 REM  PROGRAM PART 1 ------------------------------------------------------
1052 :
1053 REM  THESE LINES CONTAIN A FAST MACHINE CODE SORT ROUTINE,  THE SYNTAX FOR
1054 REM     WHOSE  COMMAND  IS  'SYS49152, (SORT DIRECTION), (LOWEST ELEMENT),
1055 REM     (ARRAY LIST)'.    THE  (SORT DIRECTION)  PARAMETER  MUST BE  EITHER
1056 REM     'A' OR 'D', DEPENDING ON WHETHER THE  KEY ARRAY IS TO BE  SORTED
1057 REM     (A)SCENDING OR (D)ESCENDING ORDER.      THE (LOWEST ELEMENT) WOULD
1058 REM     NORMALLY BE  EITHER  '0'  OR  '1',  THEREBY  PERMITTING  THE  ZERO
1059 REM     ELEMENTS OF THE LISTED ARRAYS  TO BE INCLUDED IN OR  EXCLUDED FROM
1060 REM     THE SORT AS REQUIRED.
1061 :
1062 REM  THE (ARRAY LIST) IS SIMPLY A LIST OF ARRAY NAMES SEPARATED BY COMMAS.
1063 REM     THE  FIRST-NAMED ARRAY  IS  THE KEY ARRAY,  AND ALL OTHER ARRAYS IN
1064 REM     THE LIST  WILL BE SORTED  IN CORRESPONDENCE WITH  ITS FINAL ORDER.
1065 REM     ARRAYS MAY BE OF ANY TYPE (STRING, INTEGER OR REAL), BUT THEY MUST
1066 REM     BE ONE-DIMENSIONAL  AND HAVE AN  EQUAL NUMBER OF  ELEMENTS.   NOTE
1067 REM     THAT THE ZERO SUBSCRIPT MUST BE APPENDED TO EACH ARRAY NAME IN THE
1068 REM     COMMAND LINE;  THIS IS  BECAUSE  THE  ROUTINE TAPS  INTO  BASIC'S
1069 REM     VARIABLE LOCATION CODE  AND BASIC WILL NOT RECOGNISE AN ARRAY NAME
1070 REM     UNLESS IT IS SUBSCRIPTED.
1071 :
1072 REM  A TYPICAL COMMAND LINE MIGHT READ:
1073 REM     SYS49152,A,1,NAME$(0),AGE%(0),SALARY(0)
1074 :
1075 REM  THIS COMMAND  WOULD CAUSE THE NAME$ ARRAY TO BE SORTED INTO ASCENDING
1076 REM     LEXICOGRAPHIC  ORDER  (EXCLUDING THE ZERO ELEMENT),  WITH  CORRES-
1077 REM     PONDING MOVEMENT IN THE ELEMENTS OF THE AGE% AND SALARY ARRAYS.
1078 :
1079 REM  THE ALGORITHM EMPLOYED IS THE OLD FAMILIAR SHELLSORT, BUT YOU WILL BE
1080 REM     AMAZED AT ITS SPEED.   THIS IS THE FORMULA 1 SORT!
1081 :
1082 REM  TAKE CARE,  HOWEVER,  ESPECIALLY  WHEN  SORTING INTO ASCENDING ORDER,
1083 REM     THAT  THE  KEY  ARRAY  (IF A STRING)  IS  DENSE, I.E.,  ALL OF ITS
1084 REM     ELEMENTS ARE OCCUPIED.   THE PRESENCE OF NULL STRING ELEMENTS WILL
1085 REM     PRODUCE PUZZLING RESULTS...
1086 :
1087 OPEN15,8,15:OPEN2,8,2,"PPCODE,P,W":INPUT#15,A:IFA=63THEN1090
1088 PRINT#2,CHR$(0)CHR$(192);:FORX=49152TO50243:READH$:D=0:FORY=1TO2
1089 A=ASC(MID$(H$,Y,1))-48:D=D*16+A+7*(A>9):NEXT:PRINT#2,CHR$(D);:NEXT
1090 CLOSE2:CLOSE15:IFQ=0THEN1196
1091 GOTO1197:DATAA8,00,85,02,20,FD,AE,C9,41,F0,07,C9,
     44,F0,06,4C
1092 DATA08,AF,A9,00,2C,A9,80,8D,B6,C2,20,73,00,20,FD,AE
1093 DATAC9,30,F0,0C,C9,31,D0,E7,A8,40,0D,B6,C2,8D,B6,C2
1094 DATAA8,B7,85,FD,A9,C2,85,FE,20,73,00,20,79,00,F0,60
1095 DATAC9,2C,D0,C8,20,73,00,20,8B,B0,38,A5,47,E9,07,85
1096 DATA71,A5,48,E9,00,85,72,A0,04,B1,71,C9,01,F0,08,A2
1097 DATA00,2C,A2,16,4C,73,C2,C8,B1,71,A6,02,F0,05,CD,B5
1098 DATAC2,D0,EF,8D,B5,C2,C8,B1,71,A6,02,F0,05,CD,B4,C2
1099 DATAD0,E0,8D,B4,C2,A0,03,B9,45,00,91,FD,88,10,F8,18
1100 DATAA5,FD,69,04,85,FD,A5,FE,69,00,85,FE,E6,02,D0,98
1101 DATAAD,B4,C2,D0,03,CE,B5,C2,CE,B4,C2,AD,B4,C2,8D,B2
1102 DATAC2,AD,B5,C2,8D,B3,C2,AD,B2,C2,C9,02,A0,B3,C2,E9
1103 DATA00,B0,01,60,4E,B3,C2,6E,B2,C2,38,AD,B4,C2,ED,B2
1104 DATAC2,8D,AC,C2,AD,B5,C2,ED,B3,C2,8D,AD,C2,A9,00,85
1105 DATA02,A2,FF,2C,B6,C2,50,01,E8,8E,B0,C2,8E,B1,C2,EE
1106 DATAB0,C2,D0,03,EE,B1,C2,AD,AC,C2,CD,B0,C2,AD,AD,C2
1107 DATAED,B1,C2,B0,06,A5,02,D0,D4,F0,AC,A2,03,BD,B7,C2
1108 DATA95,45,CA,10,F8,A5,47,85,58,A5,48,85,59,AD,B0,C2
1109 DATA85,71,AD,B1,C2,85,72,20,2A,B3,85,FB,84,FC,18,AD
1110 DATAB0,C2,6D,B2,C2,8D,AE,C2,AD,B1,C2,6D,B3,C2,8D,AF
1111 DATAC2,A2,03,BD,B7,C2,95,45,CA,10,F8,A5,47,85,58,A5
1112 DATA48,85,59,AD,AE,C2,85,71,AD,AF,C2,85,72,20,2A,B3
1113 DATA2C,B6,C2,30,51,24,45,30,1C,24,46,30,27,A5,FB,A4
1114 DATAFC,20,A2,BB,A5,47,A4,48,20,5B,BC,F0,02,10,03,4C
1115 DATAEF,C0,4C,04,C2,A0,01,B1,47,D1,FB,88,B1,47,F1,FB
1116 DATAB0,ED,90,EE,A0,02,B1,FB,99,4E,00,B1,47,99,51,00
1117 DATA88,10,F3,C8,C4,4E,B0,D7,C4,51,B0,D3,B1,4F,D1,52
1118 DATA90,CD,F0,EF,B0,CC,24,45,30,18,24,46,30,23,A5,47
1119 DATAA4,48,20,A2,BB,A5,FB,A4,FC,20,5B,BC,F0,B1,30,AF
1120 DATA10,32,A0,01,B1,FB,D1,47,88,B1,FB,F1,47,B0,A0,90
1121 DATA23,A0,02,B1,FB,99,4E,00,B1,47,99,51,00,88,10,F3
1122 DATAC8,C4,4E,B0,0C,C4,51,B0,08,B1,52,D1,4F,F0,F1,B0
1123 DATA03,4C,EF,C0,A9,01,85,02,A9,B7,85,14,A9,C2,85,15
1124 DATAA0,03,B1,14,99,45,00,88,10,F8,A5,47,85,58,A5,48
1125 DATA85,59,AD,B0,C2,85,71,AD,B1,C2,85,72,20,2A,B3,85
1126 DATA22,84,23,AD,AE,C2,85,71,AD,AF,C2,85,72,20,2A,B3
1127 DATA24,45,30,07,24,46,30,06,A0,04,2C,A0,01,2C,A0,02
1128 DATAB1,22,AA,B1,47,91,22,8A,91,47,88,10,F3,18,A5,14
1129 DATA69,04,90,02,E6,15,85,14,C5,FD,A5,15,E5,FE,90,A0
1130 DATA4C,EF,C0,BD,81,C2,F0,06,20,D2,FF,E8,D0,F5,4C,74
1131 DATAA4,0D,54,4F,4F,20,4D,41,4E,59,20,44,49,4D,45,4E
1132 DATA53,49,4F,4E,53,0D,00,0D,41,52,52,41,59,20,53,49
1133 DATA5A,45,53,20,44,49,46,46,45,52,0D,00,00,00,00,00
1134 DATA00,00,00,00,00,00,00,00,00,00,00
1135 :
1136 REM  THE 'READ#' FEATURE  IS A  NEAT  PROGRAMMING  TRICK TO  ENABLE  US TO
1137 REM     FETCH A  RECORD OF  SPECIFIED LENGTH  FROM A  DISK RELATIVE  FILE.
1138 REM     THIS CAPABILITY,  IN TURN,  PERMITS RELATIVE RECORDS  TO BE STORED
1139 REM     WITHOUT  SEPARATORS,  THEREBY  GREATLY  INCREASING  MAXIMUM  DISK
1140 REM     STORAGE CAPACITY.    THE PROGRAM  FORMATS  ITS OWN  DATA DISKS  ON
1141 REM     DEMAND,   IN SUCH A WAY THAT EVERY AVAILABLE BYTE ON THE DATA DISK
1142 REM     IS USED.    THUS,  A DATA DISK  CAN HANDLE UP TO 8,888  INDIVIDUAL
1143 REM     PERFORMANCE RECORDS FOR 1,200 THOROUGHBREDS!    THE ENFORCED USE OF
1144 REM     RECORD SEPARATORS WOULD REDUCE THIS CAPACITY BY ABOUT 10 PER CENT.
1145 :
1146 REM  THE '&STR$' FEATURE ALLOWS  A STRING FIELD  OF  SPECIFIED LENGTH  AND
1147 REM     CONTENT  TO  BE  ESTABLISHED,  THEREBY  SIMULATING  THE  'STRING$'
1148 REM     FUNCTION FOUND IN MORE SOPHISTICATED VERSIONS OF BASIC.
1149 :
1150 REM  THE USE OF 'MID$'  AS A KEYWORD AS WELL AS  A FUNCTION  ENABLES US TO
1151 REM     'POKE' SUB-RECORDS INTO A STRING FIELD.    ANY USER WHO HAS DABBLED
1152 REM     WITH RELATIVE FILES  WILL RECOGNISE  THE VALUE  OF THIS FACILITY -
1153 REM     IT AVOIDS THE NECESSITY  OF A LOT OF  AWKWARD STRING CONCATENATION.
1154 REM     THE  SYNTAX  OF  THE  STATEMENT  IS  'MID$(<VARIABLE>,<POSITION>,
1155 REM     <LENGTH>) = <STRING>'.    IF THE LENGTH  OF THE SOURCE STRING  IS
1156 REM     GREATER  THAN THAT  SPECIFIED  IN THE  'MID$' COMMAND,  THE EXTRA
1157 REM     CHARACTERS  ARE  IGNORED;  IF LESS,  ONLY AS MANY  CHARACTERS  ARE
1158 REM     REPLACED AS THE SOURCE STRING CONTAINS.
1159 :
1160 REM  CODE TO TEST FOR 'RESTORE', 'READ' AND 'MID$' ----------------------
1161 DATA20,73,00,88,C9,8C,F0,0C,C9,87,F0,2C,C9,CA,F0,70,20,4C,E7,A7
1162 :
1163 REM  CODE TO PERFORM 'RESTORE' (OLD AND NEW VERSIONS) ---------------------
1164 DATA20,28,73,00,D0,86,20,1D,A8,4C,AE,A7,20,9E,AD,20,F7,B7,20,13,A6
1165 DATAA4,60,A6,5F,D0,01,88,CA,86,41,84,42,4C,AE,A7
1166 :
1167 REM  CODE TO PERFORM 'READ' (OLD AND NEW VERSIONS) ----------------------
1168 DATA28,20,73,00,C9,23,F0,05,20,D6,AC,4C,AE,A7,20,9B,B7,20,1E,E1,20
1169 DATAF0,AE,20,9E,B7,8A,48,20,FD,AE,20,8B,B0,85,49,84,4A,20,A3,B6,68
1170 DATA20,75,B4,A0,02,B9,61,00,91,48,88,10,F8,C8,20,12,E1,91,62,C8,C4
1171 DATA61,D0,F6,20,CC,FF,4C,AE,A7
1172 :
1173 REM  CODE TO ENABLE 'MID$' AS BOTH FUNCTION AND KEYWORD -----------------
1174 DATA28,20,73,00,20,FA,AE,20,8B,B0,85,64,84,65,85,49,84,4A,20,A3,B6
1175 DATAA8,00,B1,64,48,F8,2E,20,52,AA,A0,01,B1,49,85,05,C8,B1,49,85,06
1176 DATA20,FD,AE,20,9E,B7,8A,F0,17,CA,86,64,20,79,00,C9,28,D0,04,A9,FF
1177 DATAD0,0C,20,FD,AE,20,9E,B7,8A,D0,03,4C,48,B2,85,03,68,38,E5,04,C5
1178 DATA03,B0,02,85,03,20,F7,AE,A9,B2,20,FF,AE,20,8E,AD,20,A3,B6,A0,02
1179 DATA81,64,85,51,88,B1,64,85,50,88,B1,64,F0,D3,C5,03,B0,02,85,03,A5
1180 DATA05,18,65,04,85,05,90,02,E6,06,A4,03,88,B1,50,91,05,C0,00,D0,F7
1181 DATA4C,AE,A7
1182 :
1183 REM  CODE TO PERFORM '&STR$' FUNCTION ------------------------------------
1184 DATAA9,00,85,8D,20,73,00,C9,5C,F0,86,20,79,00,4C,8D,AE,20,73,00,C9
1185 DATAC4,F0,03,4C,08,AF,20,73,00,20,FA,AE,20,8E,B7,8A,48,20,FD,AE,20
1186 DATA9E,AD,24,8D,38,0C,20,AA,B1,A5,64,D0,24,A5,65,4C,16,C4,20,82,B7
1187 DATAF0,1A,A0,00,B1,22,85,03,68,20,7D,B4,A8,F0,87,A5,03,88,91,62,D0
1188 DATAF8,20,CA,B4,4C,F7,AE,4C,49,B2
1189 :
1190 REM  CODE TO ENGAGE THE FOREGOING FEATURES -------------------------------
1191 DATAA9,BB,A0,C2,8D,08,03,8C,09,03,A9,D1,A0,C3,8D,0A,03,8C,0B,03,60
1192 :
1193 REM  PROGRAM PART 2 ------------------------------------------------------
1194 :
1195 REM  ENGAGE MACHINE CODE ROUTINES ----------------------------------------
1196 IFQ=0THENQ=1:LOAD"PPCODE",8,1
1197 SYS50223:GOSUB5080
1198 :
1199 REM  DISPLAY MENU --------------------------------------------------------
1200 CLR:PRINTCHR$(142):OPEN1,0
1201 PRINT"{CLR}1. INPUT AND FILE NEW DATA":PRINT"2. VIEW A HORSE'S RECORD"
1202 PRINT"3. EDIT A HORSE'S RECORD":PRINT"4. FORMAT NEW DATA DISK"
1203 PRINT"5. CALL THE DOCTOR":PRINT"6. DISPLAY INDEX":PRINT"7. EXIT PROGRAM"
1204 PRINT"{2DOWN}ENTER REQUIRED OPERATION (1-7)! ";:INPUT#1,OP%:PRINT
1205 CLOSE1:ONOP%GOTO1300,1400,1500,1600,1900,2000,1700
1206 GOTO1200
1207 :
1208 REM  INPUT AND FILE NEW DATA -------------------------------------------
1209 CLR:GOSUB5050:INPUT"{CLR}HOW MANY MEETINGS TO FILE";NM%:DIMM%(NM%):PRINT
1210 FORX=1TONM%:PRINT"MEETING"X"! HOW MANY RACES";:INPUTM%(X):NR%=NR%+M%(X)
1211 NEXT:DIMRR%(NR%):FORX=1TONM%:PRINT"{DOWN}MEETING"X"! ";:FORY=1TOM%(X)
1212 R=R+1:PRINTTAB(12)"RACE"Y"! ";TAB(20);:INPUT"# OF RATED RUNNERS";RR%(R)
1213 NH%=NH%+RR%(R):NEXTY:NEXTX:DIMH$(NH%):R=0
1214 FORX=1TONM%:PRINT"{DOWN}MEETING"X:GOSUB5000:GOSUB5170
1215 FORY=1TOM%(X):R=R+1:PRINT"{2DOWN}RACE"Y:GOSUB5180
1216 PRINT"{2DOWN}";:RESTORE7990+10*RS%:READNC%:FORZ=1TONC%:GOSUB5080:READT$,CR%:
     PRINTT$;:NEXT
1217 PRINT"{DOWN}WHICH CLASS (1"(-NC%)"{LEFT})";:INPUTQC%:IFQC%<1ORQC%>NC%THEN13
     07
1218 RESTORE7990+10*RS%:READNC%:FORZ=1TOQC%:READT$,CR%:NEXT
1219 GOSUB5190:INPUT"LIMIT WEIGHT (KG)(4SPC)";LW:INPUT"QUALITY ADJUSTMENT(3SPC)"
     ;QA
1220 FORG=1TORR%(R):OPEN1,8,HP%=HP%+1:PRINT"{2DOWN}HORSE"G;H$(HP%)=&STR$(36," ")
1221 PRINT"{DOWN}NAME(17SPC)";:INPUT#1,H$:IFLEN(H$)<19THEN1314
1222 PRINT"{2DOWN}NAME MUST NOT EXCEED 18 CHARACTERS!!!":GOTO1312
1223 PRINT:PRINT"WEIGHT CARRIED (KG)(2SPC)";:INPUT#1,WC:PRINT
1224 PRINT"BARRIER POSITION(5SPC)";:INPUT#1,BP%:PRINT
1225 PRINT"BEATEN MARGIN(8SPC)";:INPUT#1,BM:BM=1.5*BM:IFBM<0THEN1316
1226 PRINT:PRINT"INCIDENTAL ADJUSTMENT";:INPUT#1,IA:PRINT:CLOSE1
1227 BA=ABS((BP%>MB%)*(BP%-MB%))/2:IFBM>THEN1323
1228 PRINT"WAS "H$"'S WINNING MARGIN 2 LENGTHS OR MORE (Y/N)?"
1229 GOSUB5060:IFK$="Y"THENBM=BM-1.5
1230 PRINT"WAS "H$" CLOSE TO THE PACE THROUGHOUT (Y/N)?"
1231 GOSUB5060:IFK$="Y"THENBM=BM-1.5
1232 IF(RS%<4ANDGC%<5)OR(RS%=4ANDGC%<6)OR(RS%=5ANDGC%<4)THENBM=BM-AI%
1233 M3=AI%+.5*(AI%=6)+(AI%=7)+1.5*(AI%=8)+2*(AI%=9)+3*(AI%=10)+4*(AI%=11)
1234 IFQC%>4AND((RS%=1ANDGC%<10)OR(RS%<4ANDGC%<9))THENBM=BM-M3
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1326 IFRS%=4ANDQC%)5ANDQC%(13THENBM=BM-M3
1327 IFRS%=5ANDQC%)3ANDQC%(8THENBM=BM-M3
1328 WR=CR%*WC-LW-BM+BA+IA+(RD%)1200)*((RD%-1200)/400)
1329 WR=INT(WR)-.5*(WR-INT(WR)).25)-.5*(WR-INT(WR)).75)
1330 MID$(H$(HP%),1,18)=H$+MID$(H$(HP%),23,3)+DT$
1331 MID$(H$(HP%),26,1)=CHR$(TR%)+MID$(H$(HP%),27,4)+RIGHT$(STR$(RD%),4)
1332 MID$(H$(HP%),31,1)=CHR$(TC%)+MID$(H$(HP%),32,1)+CHR$(2*WR)
1333 PRINT"[DOWN]"H$"'S RATING:"WR
1334 PRINT"[DOWN]DETAILS CORRECT (Y/N)?":GOSUB5060:IFK$="N"THENQ=Q-1:HP%=HP%-1
1335 NEXT:QNEXTY:NEXTX:CLOSE1:SYS49152,A,1,H$(0):Z$=£STR$(18,"Z")
1336 FORX=1TOHP%:H$=LEFT$(H$(X),18):DT%=DT%+1:D$=RIGHT$("[2SPC]"+STR$(DT%),4)
1337 GOSUB5040:GOSUB5140:IFFL%THENGOSUB5160:GOTO1343
1338 IFX=1THEN1342
1339 FORY=X-1TO1STEP-1:IFH$(Y)=Z$THEN1341
1340 IFH$=LEFT$(H$(Y),18)THENFL%=1:Y=1:NDX=DT%-1
1341 NEXTY
1342 IFFL%=0THENFL%=01MID$(H$(X),19,4)=D$:GOTO1345
1343 P%=NDX:GOSUB5150:READ#3,14,K$:GOSUB5160:IFNDX%THEN1343
1344 MID$(K$,11,4)=D$:GOSUB5150:PRINT#3,K$;
1345 P%=DT%:GOSUB5150:PRINT#3,RIGHT$(H$(X),14));:IFFL%THENH$(X)=Z$
1346 CLOSE3:CLOSE15:NEXT:P%=0:GOSUB5130
1347 SYS49152,A,1,H$(0)
1348 IFH$(1)=Z$ORASC(H$(1))=255THEN1352
1349 P%=P%+1:GOSUB5150:READ#3,22,K$
1350 IFH$(1)<K$THENGOSUB5150:PRINT#3,LEFT$(H$(1),22);:H$(1)=K$:GOTO1347
1351 GOTO1348
1352 CLOSE3:CLOSE15:IFP%THENIT%=P%
1353 GOSUB5120:GOTO1200
1398 :
1399 REM  VIEW A HORSE'S RECORD ------------------------------------------
1400 CLR:GOSUB5230:GOSUB5220:GOSUB5140:GOSUB5160
1401 P%=NDX:GOSUB5150:READ#3,14,K$:GOSUB5210:PRINTTAB(4)DT$;:GOSUB5240
1402 PRINTTAB(13)RT$TAB(23)RD$TAB(28)G$TAB(34)WR"[LEFT]":GOSUB5160:IFNDX%THEN1401
1403 CLOSE3:CLOSE15:GOSUB5081:GOTO1200
1498 :
1499 REM  EDIT A HORSE'S RECORD -----------------------------------------
1500 GOSUB5230:GOSUB5140:GOSUB5160:LD%=ND%
1501 P%=ND%:GOSUB5150:READ#3,14,K$:GOSUB5210:SL%=SL%+1:IFSL%=1THENGOSUB5220
1502 IFSL%/20=INT(SL%/20)THEN1505
1503 Z=SL%:GOSUB5090:PRINTTAB(4)DT$;:GOSUB5240
1504 PRINTTAB(13)RT$TAB(23)RD$TAB(28)G$TAB(34)WR"[LEFT]":GOSUB5160:IFNDX%THEN1501
1505 PRINT"[DOWN]ENTER RECORD NUMBER AS SHOWN OR ZERO FORNEXT PAGE: ";
1506 K%=0:OPEN1,0:INPUT#1,K%:CLOSE1:PRINT:IFK%=0ANDND%=0THENCLOSE3:CLOSE15:GOTO1
200
1507 IFK%=0THEN1501
1508 ND%=LD%:FORX=1TOK%:P%=ND%:LD%=P%:GOSUB5150:READ#3,14,K$
1509 GOSUB5160:NEXT:GOSUB5210:PRINT"[CLR][5DOWN]1. DATE[4SPC]: "DT$
1510 GOSUB5240:PRINT"2. TRACK[3SPC]: "TR$:PRINT"3. DISTANCE: "RD$
1511 PRINT"4. GOING[3SPC]: "G$:PRINT"5. RATING[2SPC]: "WR
1512 INPUT"[2DOWN]EDIT WHICH FIELD (1-5)[5SPC][5LEFT]"/K%
1513 IFK%<1ORK%>5THENPRINT"[3UP]":GOTO1512
1514 ONK%GOSUB5000,1516,1516,5190,1517
1515 GOSUB5200:P%=LD%:GOSUB5150:PRINT#3,K$;:CLOSE3:CLOSE15:GOTO1200
1516 GOSUB5170:GOTO5180
1517 PRINT"[2DOWN]ENTER AMENDED RATING: ";:OPEN1,0:INPUT#1,WR:CLOSE1:PRINT
1518 WR=INT(WR)-.5*(WR-INT(WR)).25)-.5*(WR-INT(WR)).75)
1519 IFWR>80THENPRINT"NONSENSE - THE RATING IS GROSSLY EXAGGERATED.":GOTO1517
1520 RETURN
1598 :
1599 REM  FORMAT NEW DATA DISK -------------------------------------------


1600 GOSUB5000:PRINT"[DOWN]THIS TAKES SEVERAL MINUTES - PLEASE STAND BY..."
1601 OPEN15,8,15,"N0:RACING FORM,RF":GOSUB5131:P%=1200:GOSUB5150
1602 PRINT#3,CHR$(255):CLOSE3:GOSUB5141:P%=9999:GOSUB5150:PRINT#3,CHR$(255)
1603 CLOSE3:CLOSE15:GOTO1200
1698 :
1699 REM  LAST TRAIN FROM PITTSBURGH!! ----------------------------------
1700 SYS64738:REM  LEAVE EVERYTHING AS WE FOUND IT...
1879 :
1880 REM  CALL THE DOCTOR ------------------------------------------------
1881 :
1882 REM  IT WILL INEVITABLY HAPPEN THAT  A HORSE'S NAME WILL BE MISSPELLED AT
1883 REM     ENTRY TIME.    IF THE ANIMAL DOES NOT ALREADY HAVE A RECORD IN THE
1884 REM     DATABASE, NOT MUCH HARM IS DONE.    IT IS QUITE A SIMPLE MATTER TO
1885 REM     INVOKE THE EDITOR  TO CORRECT THE ENTRY.   HOWEVER,  SINCE 'PHIL'
1886 REM     USES A SYSTEM OF LINKED LISTS,    THE MISSPELLING OF THE NAME OF A
1887 REM     RECORD ALREADY ON FILE CAN LEAD TO HIDEOUSLY INCORRECT OUTPUT.
1888 :
1889 REM  IN THE AUTHOR'S EXPERIENCE, APOSTROPHES ARE PARTICULARLY TROUBLESOME.
1890 REM     VERY OFTEN, FORM GUIDES EITHER OMIT THEM FROM  OR ERRONEOUSLY ADD
1891 REM     THEM TO HORSE'S NAMES.   IT IS PROBABLY GOOD PRACTICE FOR THE USER
1892 REM     TO DISREGARD THEM ALTOGETHER DURING DATA ENTRY.
1893 :
1894 REM  "LOCKLEY'S TRADITION" THUS BECOMES "LOCKLEYS TRADITION" ON FILE.
1895 :
1896 REM  HOWEVER,  WHEN DUPLICATION OF ENTRIES ARISES, IT IS EASILY CORRECTED
1897 REM     BY  THE DOCTOR.    ENTER THE  CORRECT  RECORD NAME  AND THEN  THE
1898 REM     MISSPELLED NAME; THE DOCTOR WILL SOON TIDY UP THE FILES.
1899 :
1900 CLR:OPEN1,0:FL%=1:GOSUB5050
1901 H$=£STR$(18," "):PRINT"[2DOWN]CORRECT NAME[2SPC]: ";
1902 INPUT#1,K$:PRINT:MID$(H$,1,18)=K$:GOSUB5040:IFFL%THEN1904
1903 PRINT"[DOWN]NO RECORD OF THAT NAME - TRY AGAIN.":GOTO1901
1904 GOSUB5160:CI%=FE%:DC%=ND%:GOSUB5140
1905 CT%=CT%+1:P%=ND%:GOSUB5150:READ#3,14,K$:GOSUB5160:IFND%THEN1905
1906 CLOSE3:CLOSE15
1907 H$=£STR$(18," "):PRINT"[DOWN]INCORRECT NAME: ";
1908 INPUT#1,K$:PRINT:MID$(H$,1,18)=K$:GOSUB5040:IFFL%THEN1910
1909 PRINT"[DOWN]NO RECORD OF THAT NAME - TRY AGAIN.":GOTO1907
1910 CLOSE1:GOSUB5160:II%=FE%:DI%=ND%:GOSUB5140
1911 CT%=CT%+1:P%=ND%:GOSUB5150:READ#3,14,K$:GOSUB5160:IFND%THEN1911
1912 DIMK$(CT%),PT%(CT%):ND%=DC%
1913 P%=ND%:GOSUB5150:AP%=AP%+1:READ#3,14,K$:K$(AP%)=K$:PT%(AP%)=ND%
1914 GOSUB5160:IFND%THEN1913
1915 ND%=DI%
1916 P%=ND%:GOSUB5150:AP%=AP%+1:READ#3,14,K$:K$(AP%)=K$:PT%(AP%)=ND%
1917 GOSUB5160:IFND%THEN1916
1918 CLOSE3:CLOSE15:SYS49152,A,1,K$(0):SYS49152,A,1,PT%(0)
1919 GOSUB5130:P%=C1%:GOSUB5150:READ#3,22,K$
1920 MID$(K$,19,4)=RIGHT$("[4SPC]"+STR$(PT%(1)),4):P%=C1%:GOSUB5150
1921 PRINT#3,K$;:FORX=1I%+1TOIT%:P%=X:GOSUB5150:READ#3,22,K$:P%=X-1:GOSUB5150
1922 PRINT#3,K$;:NEXT:P%=IT%:GOSUB5150:PRINT#3,CHR$(255);:CLOSE3:CLOSE15
1923 IT%=IT%-1:FORX=1TOCT%-1:MID$(K$(X),11,4)=RIGHT$("[4SPC]"+STR$(PT%(X+1)),4)
1924 NEXT:MID$(K$(CT%),11,4)="[4SPC]":GOSUB5140:FORX=1TOCT%
1925 P%=PT%(X):GOSUB5150:PRINT#3,K$(X);:NEXT:CLOSE3:CLOSE15:GOSUB5120:GOTO1200
1998 :
1999 REM  DISPLAY INDEX FILE IN SEQUENCE ----------------------------------
2000 CLR:FL%=1:GOSUB5050:PRINT"[CLR]":GOSUB5130:FORX=1TOIT%:P%=X:GOSUB5150
2001 READ#3,22,K$:PRINTRIGHT$("[2SPC]"+STR$(P%),4),LEFT$(K$,18)
2002 NEXT:CLOSE3:CLOSE15:GOSUB5081:GOTO1200
4998 :


4999 REM  CONVERT 'DDMMYY' TO Y-M-D VALUES ------------------------------
5000 PRINT"[DOWN]DATE OF RACEDAY (DDMMYY): ";:OPEN1,0:INPUT#1,DT$
5001 CLOSE1:IFLEN(DT$)<>6THEN5000
5002 YYX=VAL(RIGHT$(DT$,2)):MMX=VAL(MID$(DT$,3,2)):DDX=VAL(LEFT$(DT$,2))
5003 IFDDX>80RMMX>80RYYX>0THEN5000
5004 DT$=CHR$(YYX)+CHR$(MMX)+CHR$(DDX):A1%=MMX+7*(MMX)7)-5*(MMX(8)-1:RETURN


5008 :
5009 REM  CONVERT Y-M-D TO DD.MM.YY FOR SCREEN OUTPUT -------------------
5010 DDX=ASC(MID$(K$,3,1)):MMX=ASC(MID$(K$,2,1)):YYX=ASC(K$)
5011 DT$=RIGHT$(STR$(DDX),2)+".":RIGHT$(STR$(MMX),2)+".":RIGHT$(STR$(YYX),2)
5012 RETURN
5038 :
5039 REM  PERFORM BINARY SEARCH ON INDEX FILE ----------------------------
5040 FL%=0:HI%=IT%:LO%=1:GOSUB5130
5041 P%=(HI%+LO%)/2:GOSUB5150:READ#3,22,K$
5042 IFH$=LEFT$(K$,18)THENFL%=1:GOTO5046
5043 IFHI%<=LO%THEN5046
5044 IFH$<K$THENHI%=P%-1:GOTO5041
5045 LO%=P%+1:GOTO5041
5046 CLOSE3:CLOSE15:RETURN
5048 :
5049 REM  FETCH FILE TOTALS FROM BAM SECTOR ------------------------------
5050 OPEN15,8,15:OPEN3,8,3,"#":PRINT#15,"UA:3 0 18 0"
5051 PRINT#15,"B-P:"3;248:READ#3,8,K$:CLOSE3:CLOSE15
5052 IT%=VAL(LEFT$(K$,4)):DT%=VAL(RIGHT$(K$,4)):IFFL%THENRETURN
5053 PRINT"[2DOWN]INDEX FILE HAS"1200-IT%"RECORDS FREE":PRINT"PERFORMANCES FILE
";
5054 PRINT"HAS"9999-DT%"RECORDS FREE":PRINT"[DOWN]IS THIS SUFFICIENT FOR THE ";
5055 PRINT"CURRENT RUN (Y/N)?":GOSUB5060:IFK$="N"THEN1600
5056 RETURN
5058 :
5059 REM  FETCH Y/N RESPONSE ---------------------------------------------
5060 GETK$:IFK$<>"Y"ANDK$<>"N"THEN5060
5061 RETURN
5078 :
5079 REM  PROMPT FOR DATA DISK, ETC. -------------------------------------
5080 PRINT"[2DOWN]INSERT DATA DISK AND PRESS (RETURN)."!GOTO5082
5081 PRINT"[2DOWN]PRESS (RETURN) TO CONTINUE..."
5082 POKE198,0:WAIT198,1:POKE198,0:RETURN
5088 :
5089 REM  FORMAT OPTION NUMBERS -----------------------------------------
5090 PRINTRIGHT$(STR$(Z),2)". ":RETURN
5118 :
5119 REM  WRITE FILE TOTALS ON BAM SECTOR (WHY NOT?  IT'S FREE SPACE!) ---
5120 OPEN15,8,15:OPEN3,8,3,"#":PRINT#15,"UA:3 0 18 0"
5121 K$=RIGHT$("[4SPC]"+STR$(IT%),4)+RIGHT$("[4SPC]"+STR$(DT%),4)
5122 PRINT#15,"B-P:"3;248:PRINT#3,K$;:PRINT#15,"UB:3 0 18 0"
5123 CLOSE3:CLOSE15:RETURN
5128 :
5129 REM  OPEN INDEX FILE ------------------------------------------------
5130 OPEN15,8,15
5131 OPEN3,8,3,"INDEX,L,"+CHR$(22):RETURN
5138 :
5139 REM  OPEN PERFORMANCES FILE -----------------------------------------
5140 OPEN15,8,15
5141 OPEN3,8,3,"PERFORMANCES,L,"+CHR$(14):RETURN
5148 :
5149 REM  ALL-PURPOSE 'POSITION' COMMAND ----------------------------------
5150 PRINT#15,"P"CHR$(3+96)CHR$(P%AND255)CHR$(P%/256)CHR$(1):RETURN
5158 :


5159 REM  DECODE LINK TO NEXT RECORD -------------------------------------
5160 NDX=VAL(RIGHT$(K$,4)):RETURN
5168 :
5169 REM  ESTABLISH WHICH TRACK WE'RE HANDLING ---------------------------
5170 PRINT"[2DOWN]":RESTORE7000:FORZ=1TO5:GOSUB5090:READT$:PRINTT$:NEXT
5171 INPUT"[DOWN]WHICH STATE (1-5)";RS%:IFRS%(1ORRS%)5THEN5170
5172 RESTORE7010:FORZ=1TORS%:READRL%:NEXT
5173 PRINT"[2DOWN]":RESTORERL%:READOS%,NT%:FORZ=1TONT%:GOSUB5090:READT$:PRINTT$:
NEXT
5174 PRINT"[DOWN]WHICH TRACK (1"(-NT%)"[LEFT])";:INPUTTR%:IFTR%(1ORTR%)NT%THEN51
73
5175 TR%=TR%+OS%:RETURN
5178 :
5179 REM  ESTABLISH DISTANCE OF RACE -------------------------------------
5180 PRINT"[2DOWN]":RESTORE7090:FORZ=1TOTR%:READDL%:NEXT:RESTOREDL%:READND%
5181 FORZ=1TOND%:GOSUB5090:READDR%,MB%:PRINTDR%:NEXT
5182 PRINT"[DOWN]WHICH DISTANCE (1"(-ND%)"[LEFT])";:INPUTDR%:IFDR%(1ORDR%)ND%THE
N5181
5183 RESTOREDL%:READND%:FORZ=1TODR%:READRD%,MB%:NEXT:RD$=RIGHT$(STR$(RD%),4)
5184 RETURN
5188 :
5189 REM  DETERMINE TRACK CONDITION ---------------------------------------
5190 PRINT"[2DOWN]":RESTORE7100:FORZ=1TO5:GOSUB5090:READT$:PRINTT$:NEXT
5191 INPUT"[DOWN]TRACK CONDITION (1-5)";TC%:IFTC%(1ORTC%)5THEN5190
5192 RETURN
5198 :
5199 REM  PACK OUTGOING PERFORMANCE RECORD --------------------------------
5200 GOSUB5004:MID$(K$,1,3)=DT$:MID$(K$,4,1)=CHR$(TR%)
5201 MID$(K$,5,4)=RD$:MID$(K$,9,1)=CHR$(TC%)
5202 MID$(K$,10,1)=CHR$(2*WR):RETURN
5208 :
5209 REM  UNPACK INCOMING PERFORMANCE RECORD ------------------------------
5210 GOSUB5010:TR%=ASC(MID$(K$,4,1)):RD$=MID$(K$,5,4)
5211 TC%=ASC(MID$(K$,9,1)):WR=ASC(MID$(K$,10,1))/2:RETURN
5218 :
5219 REM  PRINT HEADING ------------------------------------------------------
5220 PRINT"[CLR]"TAB(6)"DATE"TAB(15)"TRACK"TAB(23)"DIST GOING RATING";
5221 FORJ=1TO39:PRINTCHR$(163);:NEXT:PRINTCHR$(163):RETURN
5228 :
5229 REM  FETCH AND FORMAT HORSE'S NAME ----------------------------------
5230 FL%=1:GOSUB5050:H$=£STR$(18," "):PRINT"[DOWN]HORSE'S NAME: ";:OPEN1,0
5231 INPUT#1,K$:CLOSE1:PRINT:MID$(H$,1,18)=K$:GOSUB5040:IFFL%THENRETURN
5232 PRINT"[DOWN]NO RECORD OF THAT NAME - TRY AGAIN.":GOTO5230
5238 :
5239 REM  LOOK UP TRACK AND GOING -----------------------------------------
5240 RESTORE7020:RT%=TR%
5241 READOS%,NT%:IFNT%<TR%THENFORX=1TONT%:READTR$:NEXT:TR%=TR%-NT%:GOTO5241
5242 FORX=1TOTR%:READTR$:NEXT:RT$=£STR$(9," "):MID$(RT$,1,9)=TR$
5243 RESTORE7100:FORX=1TOTC%:READG$:NEXT:TR%=RT%:RETURN
6998 :
6999 REM  STATES ------------------------------------------------------------
7000 DATANSW,VIC,QLD,SA,WA
7008 :
7009 REM  DATA LINE REFERENCES FOR TRACKS BY STATES ----------------------
7010 DATA7020,7023,7026,7027,7028
7018 :
7019 REM  TRACKS ----------------------------------------------------------
7020 DATA0,10,RANDWICK,ROSEHILL,WARWICK FARM,CANTERBURY,NEWCASTLE,HAWKESBURY
7021 DATAGOSFORD,LIVONG,KEMBLA GRANGE,CANBERRA
7023 DATA10,20,FLEMINGTON,CAULFIELD,SANDOWN,MOONEE VALLEY,BALLARAT,BENDIGO


7024 DATACOLAC,CRANBOURNE,GEELONG,HAMILTON,KYNETON,MOE,MORNINGTON,PAKENHAM
7025 DATASALE,SEYMOUR,TRARALGON,WARRNAMBOOL,MERRIBEE,YARRA GLEN
7026 DATA30,4,EAGLE FARM,DOOMBEN,BUNDAMBA,SOUTHPORT
7027 DATA34,3,VICTORIA PARK,MORPHETVILLE,CHELTENHAM
7028 DATA37,2,ASCOT,BELMONT PARK
7038 :
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PROGRAM FILE

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7039 REM  DISTANCES AND BARRIER POSITIONS ------------------------------------
7040 DATA11,1000,10,1100,11,1200,12,1400,10,1600,12,1800,8,2000,10
7041 DATA2400,10,2600,15,2800,13,3200,18
7042 DATA12,900,14,1100,8,1200,10,1300,11,1400,12,1450,12,1500,13
7043 DATA1750,6,1900,7,2000,10,2400,11,3200,18
7044 DATA7,1000,13,1200,14,1400,7,1600,10,2100,10,2200,11,2400,14
7045 DATA11,1000,11,1100,12,1200,13,1250,13,1200,14,1290,14,1550,6
7046 DATA1900,10,2600,14,2800,15,3400,16
7047 DATA7,900,5,1200,9,1300,10,1400,11,1600,13,2200,10,2300,11
7048 DATA10,900,10,1000,11,1200,8,1300,10,1400,11,1600,13
7049 DATA1800,14,2000,15,2200,10,2400,13
7050 DATA6,1000,10,1100,11,1200,12,1600,8,2000,10,2700,14
7051 DATA6,1000,9,1100,10,1200,11,1350,13,1600,7,2000,10
7052 DATA6,900,10,1000,11,1200,9,1400,11,1600,13,2000,11
7053 DATA9,1000,9,1200,9,1300,10,1400,11,1600,12,2000,9,2200,12,2400,14,3200,16
7054 DATA10,900,24,1000,24,1100,24,1200,24,1400,8,1600,9
7055 DATA2000,14,2500,8,2800,12,3200,18
7056 DATA8,1000,12,1100,13,1200,14,1400,8,1600,9,1800,11,2000,11,2400,10
7057 DATA6,1000,12,1200,8,1400,11,1600,14,2100,9,2400,12
7058 DATA5,1000,11,1200,11,1600,12,2050,10,2600,14
7059 DATA6,1000,12,1200,14,1400,10,1500,11,1600,12,2200,11
7060 DATA5,1200,9,1300,10,1400,12,1600,14,2200,11
7061 DATA5,1000,9,1100,10,1200,11,1600,10,2000,11
7062 DATA3,1000,8,1300,11,2050,11
7063 DATA6,1100,7,1200,9,1500,13,1700,11,2200,11,2400,13
7064 DATA7,1100,7,1200,8,1400,10,1600,13,2000,9,2200,11,2400,13
7065 DATA6,1100,10,1200,11,1440,9,1850,10,2000,12,2820,14
7066 DATA6,1000,8,1100,10,1200,11,1600,12,2050,12,2700,13
7067 DATA5,1000,7,1200,8,1500,8,2000,10,2400,11
7068 DATA5,1000,9,1300,9,1400,10,1750,11,2400,10
7069 DATA8,1000,11,1100,12,1200,13,1400,9,1500,10,1600,11,1700,12,2200,10
7070 DATA7,1000,9,1100,10,1200,11,1400,10,1600,12,2000,10,2200,12
7071 DATA3,1100,10,1430,10,1900,10
7072 DATA8,1000,10,1100,11,1200,12,1400,14,1600,11,1700,12,2000,12,2200,14
7073 DATA5,1000,9,1500,11,2000,12,2100,13,2600,14
7074 DATA5,1000,7,1250,7,1500,9,1950,9,2700,12
7075 DATA8,1000,10,1200,8,1400,12,1600,8,1810,7,2200,8,2400,10,3200,12
7076 DATA7,1010,7,1110,8,1200,9,1350,11,1610,7,2020,8,2200,10
7077 DATA6,1000,6,1100,7,1200,8,1500,6,1666,7,2150,9
7078 DATA8,800,7,1010,6,1110,7,1200,8,1300,9,1600,8,2015,10,2400,10
7079 DATA8,900,24,1000,24,1450,6,1500,7,1600,8,1650,12,2000,14,2600,10
7080 DATA9,1050,9,1200,11,1600,10,1800,12,2000,11
7081 DATA2450,11,2500,12,2600,13,3200,12
7082 DATA7,1000,10,1350,7,1450,8,1500,9,1850,12,2250,10,2400,12
7083 DATA11,1000,7,1100,8,1200,9,1400,6,1450,7,1500,8
7084 DATA1600,7,1800,8,2200,9,2400,10,3200,14
7085 DATA11,900,8,1000,9,1200,8,1300,9,1400,10,1600,9
7086 DATA1650,10,2100,10,2200,11,2400,10,2800,14
7088 ;
7089 REM  DATA LINE REFERENCES FOR DISTANCES AND BARRIER POSITIONS ------------
7090 DATA7040,7042,7044,7045,7047,7048,7050,7051,7052,7053,7054,7056,7057,7058
7091 DATA7059,7060,7061,7062,7063,7064,7065,7066,7067,7068,7069,7070,7071,7072
7092 DATA7073,7074,7075,7076,7077,7078,7079,7080,7082,7083,7085
7098 ;
7099 REM  OFFICIAL TRACK DESCRIPTIONS ----------------------------------------
7100 DATAHEAVY,SLOW,DEAD,GOOD,FAST
7998 :
7999 REM  CLASS DATA ---------------------------------------------------------
8000 DATA22,2YO PROVINCIAL,37,2YO COLTS OR OPEN,48
8001 DATA2YO FILLIES,38,2YO QUALITY STAKES,43,3YO MIDWEEK RESTRICTED HCP,48
8002 DATA3YO RESTRICTED SET WEIGHTS,50,3YO COLTS OR OPEN,52,3YO FILLIES,51
8003 DATA3YO QUALITY STAKES,56,INTERMEDIATE,45,ADVANCED,46
8004 DATAPROVINCIAL STAKES,46,REGIONAL STAKES,48,NOVICE,48
8005 DATAMARES MIDWEEK RESTRICTED,53,H & G MIDWEEK RESTRICTED,54
8006 DATASATURDAY/HOLIDAY RESTRICTED HCP,57,FILLIES & MARES,58
8007 DATAWELTER/HIGHWEIGHT,61,OPEN HCP,67,QUALITY HCP/PROVINCIAL FEATURE,69
8008 DATAWEIGHT-FOR-AGE,67
8010 DATA28,2YO PROVINCIAL,37,2YO COLTS OR OPEN,40
8011 DATA2YO FILLIES,39,2YO QUALITY STAKES,43
8012 DATA3YO PROVINCIAL,48,3YO COLTS OR OPEN,52
8013 DATA3YO FILLIES,51,3YO QUALITY STAKES,56,IMPROVERS,45,PROGRESSIVE,48
8014 DATAINTERMEDIATE,58,NOVICE,51,ENCOURAGE,52,TRIAL,55
8015 DATA4YO & UPWARDS RESTRICTED,56,MARES,58,WELTER/HIGHWEIGHT,61
8016 DATAOPEN HCP,67,QUALITY HCP/PROVINCIAL FEATURE,69,WEIGHT-FOR-AGE,67
8020 DATA21,2YO MAIDEN,35,2YO COLTS OR OPEN,38,2YO FILLIES,36
8021 DATA2YO QUALITY STAKES,42,3YO MAIDEN,46,3YO COLTS OR OPEN,50
8022 DATA3YO FILLIES,49,3YO QUALITY STAKES,54,3YO & 4YO MAIDEN,44
8023 DATAMAIDEN,44,GRADUATION (MAIDEN & NOVICE),46,NOVICE,49
8024 DATAGRADUATION (NOVICE & TRANSITION),50,TRANSITION,51
8025 DATAGRADUATION (TRANSITION & 1UPWARDS),51,ENCOURAGE,52,TRIAL,53
8026 DATAWELTER/HIGHWEIGHT,60,OPEN HCP,65,QUALITY HCP,69,WEIGHT-FOR-AGE,65
8030 DATA21,2YO COLTS RESTRICTED,36,2YO FILLIES RESTRICTED,35,2YO COLTS,38
8031 DATA2YO FILLIES,37,2YO QUALITY STAKES,42,3YO COLTS RESTRICTED,46
8032 DATA3YO FILLIES RESTRICTED,45,3YO NOVICE,47,3YO TRANSITION,48
8033 DATA3YO COLTS,48,3YO FILLIES,48,3YO QUALITY STAKES,53,NOVICE,48
8034 DATAGRADUATION,49,TRANSITION,50,ENCOURAGE,51,MARES,56
8035 DATAWELTER/HIGHWEIGHT,59,OPEN HCP,65,QUALITY HCP,67,WEIGHT-FOR-AGE,65
8040 DATA12,2YO COLTS OR OPEN,37,2YO FILLIES,36,2YO QUALITY STAKES,42
8041 DATA3YO GRADUATION,44,3YO COLTS,48,3YO FILLIES,47,3YO QUALITY STAKES,52
8042 DATAGRADUATION,49,WELTER,59,OPEN HCP,65,QUALITY HCP,68,WEIGHT-FOR-AGE,65
8997 :
8998 REM  SUPPLEMENTARY NOTES ------------------------------------------------
8999 :
9000 REM  IN THE  INTEREST OF  MEMORY CONSERVATION,  THE COMPREHENSIVE  LIST OF
9001 REM     QUALITY RACES  WHICH  FORMED  PART OF  THE  'WIZARD OF ODDS'  DATA
9002 REM     BASE  HAS  HAD  TO BE OMITTED  FROM  THIS PROGRAM.    HOWEVER,  THE
9003 REM     QUESTION IS ASKED  AT DATA ENTRY TIME  WHETHER THE USER  WISHES TO
9004 REM     APPLY  A  QUALITY  ADJUSTMENT  TO  A  RACE.     THIS  PROVIDES  THE
9005 REM     OPPORTUNITY  TO REFLECT  THE RELATIVE STRENGTH  OF A RACE  IN  THE
9006 REM     RATINGS  OF  THE HORSES  WHICH PERFORMED WELL  IN IT.    IT SHOULD BE
9007 REM     CLEARLY UNDERSTOOD  THAT THE  CLASS RATINGS  SHOWN IN  LINES 8000+
9008 REM     ARE SIMPLY  FIGURES FOR AVERAGE RACES  IN EACH CLASS.      THE USER
9009 REM     SHOULD MAKE  EVERY EFFORT TO ASSESS  WHETHER A PARTICULAR RACE  IS
9010 REM     RELATIVELY  STRONG OR WEAK  FOR ITS CLASS  AND APPLY A POSITIVE OR
9011 REM     NEGATIVE  QUALITY  ADJUSTMENT  ACCORDINGLY.    PERHAPS A  GOOD RULE
9012 REM     WOULD BE  TO  STICK TO A  LIMIT OF  + OR - 3KG  IN ANSWER  TO  THIS
9013 REM     QUESTION.    IN ANY EVENT,  THE USER SHOULD  APPLY AN AVERAGE - 2KG
9014 REM     ADJUSTMENT  TO ANY  MIDWEEK CITY RACE  WHICH IS  NOT  PART  OF ANY
9015 REM     HOLIDAY OR CARNIVAL MEETING  AND  WHICH IS NOT  SPECIFICALLY SHOWN
9016 REM     AS A MIDWEEK CLASS OF RACE IN THE DATA LIST.
9050 :
9051 REM  INTERESTED USERS  WILL  NOTICE  THAT THE  CLASS RATINGS  FOR  YOUNGER
9052 REM     HORSES ARE  SLIGHTLY  HIGHER  IN THIS PROGRAM  THAN  IN 'WIZARD OF
9053 REM     ODDS'.  THIS IS BECAUSE,  WHETHER AS A RESULT  OF IMPROVED FEEDING
9054 REM     OR MORE  ADVANCED  TRAINING METHODS  OR A COMBINATION OF BOTH,  IT
9055 REM     HAS  BECOME  INCREASINGLY  APPARENT  THAT  THREE-YEAR-OLDS ARE NOW
9056 REM     ABLE  TO  BEAT  THEIR  SENIORS MUCH MORE FREQUENTLY  THAN HAS BEEN
9057 REM     THE  TRADITIONAL  CASE.  THIS IS PARTICULARLY TRUE  IN RACES HELD
9058 REM     UNDER  THE WEIGHT-FOR-AGE SCALE,  IN WHICH  A QUALITY  THREE-YEAR-
9059 REM     OLD  IS MUCH MORE LENIENTLY  TREATED THAN IN  A RACE  FRAMED UNDER
9060 REM     HANDICAP  CONDITIONS.  THE  AMENDED  RATINGS  ARE  AN  ATTEMPT TO
9061 REM     REFLECT  THIS  TREND  AND ALLOW US  TO  RATE  THE YOUNGER  ANIMALS
9062 REM     MORE  REALISTICALLY,    THEREBY  GIVING  US  A  BETTER  CHANCE  OF
9063 REM     ASSESSING THEM AGAINST THE OLDER ANIMALS.
READY.
```

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Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.

Check through the previous Program listings to see the kind of programs we prefer. As a rough guide, original ideas are always welcome, as are good implementations of utilities and applications. Obviously the programs should be well-written, easy to understand, and preferably not too long (remember that other readers have to type them in).

All programs should be fully debugged and your own original, unpublished work.

We prefer to receive programs with a maximum 80-column width printed in emphasised typeface.

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ANG/RA/841

Calling all graphics enthusiasts. This month Mike Mudge examines the overlap between geometry and number theory.

We draw on the entire plane squares of unit size, like those found on graph paper; the vertices of these squares are called 'Lattice Points'. Such points have been the subject of many interesting mathematical investigations since the time of Karl Friedrich Gauss (1777-1855).

We give, in increasing order of difficulty, five questions relating to these lattice points together with the state of the art regarding their solution as known to the author. Each is followed by a programming problem where it is assumed that the programmer has access to at least a minimal graphics facility, involving the ability to display lattice points, also circles having a given centre and radius together with straight lines passing through two given points.

Question 1 (due to Hugo Steinhaus, the author of the highly recommended work *Mathematical Snapshots*). For every positive integer, n, does there exist in the plane a circle having in its interior exactly 'n' lattice points?

The answer is known to be yes; however, we have to allow the coordinates of the centre to be not only non-integer but also irrational, by which we mean not of the form a/b where a and b are integers. (A Schinzel.)

Problem A. Write a computer program to count the number of lattice points within a circle having a given centre and radius. Graphical output would enhance this considerably.

Question 2 (due to J Browkin). For every positive integer, n, does there exist in the plane a square containing exactly 'n' lattice points?

The answer is again known to be yes; however, the proof is considerably more difficult than that for the circle.

Problem B. Write a computer program to count the number of lattice points within a square defined by two adjacent vertices. (Note that there are, in general, two different answers: why?)

Graphical output is again desirable.

Question 3. For every positive integer, n, does there exist a set of 'n' lattice points lying on the circumference of some circle, and such that the distance between any two of them is an integer (when expressed in terms of the mesh spacing of the lattice)?

Answered in the affirmative by W Sierpinski.

Problem C. Construct and display such sets of 'n' lattice points for n = 3,4,5 . . ., together with the associated circle upon which they lie.

Question 4 (due to K Zarankiewicz, 1951). For a positive n greater than or equal to three, consider the n^2 lattice points (x,y) where x and y are positive integers less than or equal to n, denote the set of these points by R_n.

What is the smallest positive integer k (dependent of course on n, so we write k(n)) for which *each* subset R_n having k(n) points contains nine points in three different rows and three different columns?

It is known that k(4) = 14, k(5) = 21, k(6) = 27 (W Sierpinski), and that k(7) = 34 (J Brzezinski).

Problem D. Write a computer program to display the n^2 lattice points and allow the user to select k(n) of these (or to delete $n^2 - k(n)$) before determining a set of nine points satisfying the above condition.

Initially restrict the program to n = 4,5,6 and 7 but, hopefully, extend the values of k(n)!

Question 5 (due to Mazurkiewicz *c* 1914). Does there exist in the plane a set of lattice points with which every straight line in the plane has exactly two points in common?

The answer is yes and has been established using the logical tool known as the axiom of choice; however, no concrete example of such a set is known.

Problem E. How can the computer help here?

Readers are invited to submit their attempts at some (or all) of the above problems to: Mike Mudge, C/- *APC*, 2nd Floor, 215 Clarence Street, Sydney 2000.

Submissions, which must reach me by 25 June 1986, will be judged using suitably vague criteria. A prize will be awarded for the best entry received.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.

November review

Responses to the topic of continued fractions were extremely varied. In addition to the references given in *APC* (November 1985), mathematically inclined readers should consult *Exercises in Number Theory* by DP Parent (Springer Verlag 1984, ch9).

The future interest in applied numerical continued fractions seems likely to lie in investigating the relationship between the CF expansion of an algebraic number (that is, a number which is the root of a poly-nominal equation with integer coefficients) and the properties of the sequence of quasi-random numbers nx − [nx], n=1,2,3 . . . where [nx] denotes the greatest integer not greater than nx (the computer function Entier of Int).

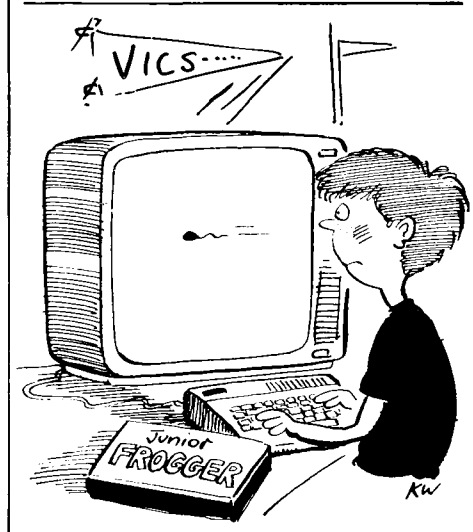
Thus $n\sqrt{2} - [n\sqrt{2}]$ yields values approximately .4142, .8284, .2426, .6569, .0711 and so on.

Such numbers may be used to model a Uniform Distribution over the interval 0,1 for certain simulations; that is, Monte-Carlo Techniques and, in particular, numerical integration. Extensive references are available on request.

This month's prizewinner is Richard F Tindall for an extensive submission combining analytical methods.

Much of Richard's work is concerned with the determination of an empirical function for the longest periods of second-degree algebraic numbers.

(See CD Patterson and HC Williams' *Some Periodic Continued Fractions with Long Periods. Mathematics of Computation* (Vol 44 No 170 pp523-532 April 1985) including the square root of 46257585588439 with period 25679652. Their paper mentions the work of GF Voronoi, *On the generalisation of the algorithm of continued fractions*, Doctoral Dissertation Warsaw 1896 in Russian (any volunteers to translate?) END



MICROCHESS

Kevin O'Connell looks back at the overwhelming success of Hegener & Glaser's Mephisto machines at the 1985 World Microcomputer Championship in Amsterdam.

In the 1985 World Microcomputer Championship, the fifth, played in Amsterdam, the West German chess computer manufacturer Hegener & Glaser was spectacularly successful with its team of three Mephisto machines.

The results of the tournament were:

(1) Mephisto Amsterdam I,8 out of 8;

(2-3) Mephisto Amsterdam II, Mephisto Amsterdam III 7;

(4) Princhess 6 (Sweden), 4½;

(5-6) Novag Blitz Monster Y (Hong Kong, Plymate Y (Sweden), 4;

(7-10) Orwell X (West Germany), Orwell Y (West Germany), Plymate Z (Sweden), SciSys Turbostar K (Hong Kong), 3½;

(11-14) Novag Blitz Monster Y (Hong Kong), Orwell Z (West Germany), Plymate X (Sweden), SciSys Turbostar 440 (Hong Kong), 3;

(15) SciSys Turbostar G (Hong Kong), 2½;

(16) Novag Blitz Monster X (Hong Kong), 1.

Results in the Amateur group were:

(1) Nona (Holland), 7 out of 7;

(2) Rebel (Holland), 4;

(3) Tumult (Romania), 3½;

(4) Kempelen I (Hungary), 1½;

(5) PK83 (Holland), 0.

It was interesting to see that the only non-Dutch entries in this section both came from Eastern Europe.

The huge success of the Mephisto team was due to three important factors: these machines did contain the strongest program (the same one in all three, but running significantly faster in the Amsterdam I incarnation), they did not have to play against each other which was lucky, since in many cases the opposition went out of its way to lose.

Those of you who read Microchess last month will be aware of one very good reason why programs from the same stable should not play against each other. On the other hand, in an event like this, when teams of identical programs are permitted, only a small edge is necessary to make it appear that one program is invincible.

My abiding memories of the games from this tournament are of Mephisto sitting and doing nothing quite well, simply waiting for its opponents to make decisive mistakes, which they were all kind enough to do, even though several of them stood better at various times. The game which follows is a representative example.

White: Orwell X. Black: Mephisto Amsterdam I. Opening: Nimzowitsch/Larsen Opening.

1	Ngl-f3	d7-d5
2	b2-b3	Bc8-g4
3	e2-e3	e7-e5
4	Bf1-e2	Nb8-c6
5	0-0	—

5 Bcl-b2 is rather better — it puts pressure on the black e-pawn and, after 5 . . . e5-e4, provides piece support for the knight on d4. Incidentally, 5 . . . e5-e4 there would be terrible, making White's dark-shaped bishop a superb piece.

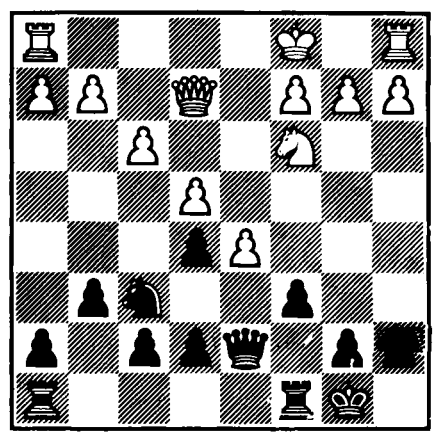
5	. . .	e5-e4
6	Nf3-d4	Bg4xe2
7	Qdlxe2	

7 Nd4xe2 is preferable, retaining fluid piece play against Black's ossified pawn centre.

7	. . .	Nc6xd4
8	e3xd4	Qd8-e7?

This is just a complete waste of time. The queen should have gone straight to d7, or to f6, or nowhere at all.

9	Bcl-a3	Qe7-d7
10	Ba3xf8	Ke8xf8
11	Nb1-c3	Ng6-f6
12	f2-f3	c7-c6



Chessboard 1

13	Ra1-e1	

13 f3xe4 is fine: 13 . . . d5xe4 14 Nc3xe4 Qd7xd4+ (14 . . . Ra8-e8? 15 Ne4xf6!) 15 Ne4-f2 with a very slight edge for White.

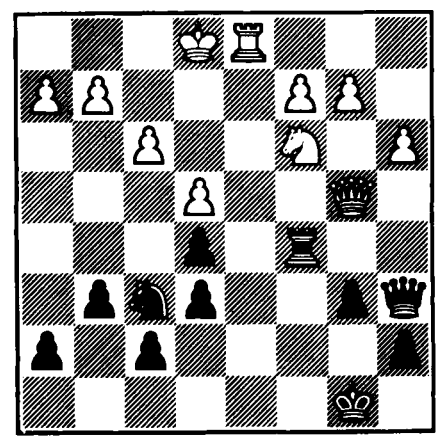
13	. . .	Ra8-e8
14	d2-d3	e4xf3
15	Qe2xf3	Qd7-g4
16	Re1xe8+?	

This is a serious mistake, ceding the e-file, bringing Black's king into the centre and helping to prepare the entry into the game of the black rook on h8. Simply exchanging on g4 and then putting the knight, temporarily, on d1 was much better.

16	. . .	Kf8xe8
17	Qf3-e3+	Ke7-d7
18	Rf1-f4	Qg4-g5
19	Qe3-e5	h7-h6
20	Qe5-e3?	

Still, White would have been all right after 20 Qe5xg5, but now the last black piece gets into the act and all three combine together very forcefully.

20	. . .	Rh8-e8
21	Qe3-h3+	Kd7-d8
22	g2-g3	



Chessboard 2

22	. . .	Re8-e1+
23	Kgl-f2	Re1-cl

Winning material.

24	Nc3-e2	Rc1xc2
25	a2-a4	

White can do nothing constructive or even defensive.

25	. . .	Rc2-b2
26	Qh3-g2	Rb2xb3
27	Qg2-f1	Qg5-g6
28	Ne2-c1	Rb3-b4
29	Qf1-d1	Nf6-h5
30	Rf4-h4?	

Of course if the rook goes back to

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Documentation is included on the disks where required — often it is very extensive. Unfortunately, we are unable to provide telephone tutorials on using the programmes.

MS-DOS disks are formatted for standard MS-DOS 2.11 360K. Testing has been carried out for CP/M disks on a Z80 Kaypro II. About 120 different formats are supported, including Kaypro, Osborne, Tandy, Microbee, Bondwell, Commodore 128, Televideo and Apple II, but not Commodore 64.

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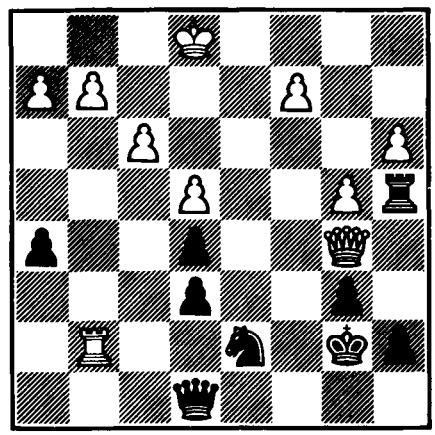
MICROCHESS

f3, then the d4 pawn falls, but this is a hopeless place for the rook.

30	...	Qg6-f5+
31	Kf2-g2	Rb4-b2+
32	Nc1-e2	g7-g5
33	Rh4xh5	Qf5-g4



Chessboard 3

34	Kg2-f2	

Or 34 Rh5xh6 Rb2xe2+ 35 Kg2-g1 (otherwise 35 ... Qg4-f3+ and mate next move) and now black has a choice between 35 ... Re2-g2+, winning the queen, and 35 ... Qg4xd4+ 36 Kg1-f2, winning the queen since Qd1xe2 is forced to avoid mate.

34	...	Qg4xh5
35	Qd1-f1	Qh5xh2+
36	Kf2-f3	f7-f5
37	a4-a5	c6-c5
38	a5-a6	c5-c4
39	Qf1-e1	

White is completely stuck. Note that if 39 d3xc4, then 39 ... Rb2-b3+ is the end.

39	...	c4xd3
		0-1 (White resigns)

Everything falls to pieces now; for example, 40 Ne2-c3 (to stop the black queen from giving mate on e4) 40 ... Qh2-g2+ 41 Kf2-e3 d3-d2 is the end — if there is nothing better next move, Black plays d2-d1N+! END

LAZING AROUND

Brain-teasers courtesy of JJ Clessa.

Quickie

No prizes, no answers.

Here's a remark attributed to that famous geometrician Mr Pi Thagorus, following an important discovery: 'Now I have a rough predictor of circle areas and volume.'

What's odd about that?

Prize puzzle

My thanks to Mr Peter Scoging for this month's prize puzzle, which concerns palindromic numbers and number bases. Nice one, Peter!

For the uninitiated, a palindromic number is one which reads the same from right to left as from left to right; for example, 1234321, 979, and so on.

Also for the uninitiated, number bases greater than 10 use the letters A, B and C to represent the numbers 10, 11 and 12 respectively, and so on. Therefore, the decimal number 168 would be CC in base 13 and 143 would be BB in base 12. Here's the puzzle:

My telephone number consists of a seven-digit number.

The first three digits constitute the only three-digit number which is palindromic in five number bases lower than base 17.

The second four digits constitute the *highest* four-digit number which is palindromic in three consecutive number bases lower than base 17.

What is my phone number (or perhaps you'd rather write!)

Answers, on postcards only please, to reach *APC* at 215 Clarence Street, Sydney 2000, not later than 15 June 1986.

February prize puzzle

The winning card, which contained all three possible solutions, was submitted by Gavin Puche of Reservoir, Victoria. Congratulations Gavin, your prize is on its way.

The three solutions are:

$\frac{95742}{10638} = 9\ \frac{95823}{10647} = 9\ \frac{97524}{10836} = 9$

DIARY DATA

Sydney	Unixworld '86 Contact: Stephen Moore (02) 439 5133	May 6-8, 1986
Montreal, Canada	MIM '86 Contact: MIM Inc, 300 Leo-Parisean, Suite 1919, Montreal, Quebec H2W 2P4	May 12-14, 1986
Melbourne	EDPAC 86 Contact: EDPAC 86, PO Box 731, Toowong Qld, 4066. (07) 371 7900	May 26-28, 1986
Melbourne	PC86 — The Seventh Australian Personal Computer Show also incorporating Communication '86 and Office Technology '86. Contact: Ms F Michael, Australian Exhibition Services Pty Ltd Suite 3.3, 424 St Kilda Road Melbourne 3004. (03) 267 4500	June 1-4, 1986
Nice, France	Comdex International Contact: Interface Group Headquarters, World Trade Center, Strawinskylaan 1245, 1077 XX Amsterdam, The Netherlands. (31) 20 621941	June 10-12, 1986
Sydney	Videotex '86 Contact: Riddell Exhibition Promotions (03) 429 6088	July 1-3, 1986
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BENCHMARKS

A list of Benchmarks used when evaluating micros is given below. An explanation can be found in the February '84 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GUSUB220
170 FORL=1 TO 5
180 NEXTL
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXTL
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K  2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```


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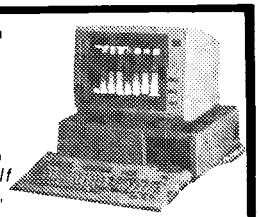

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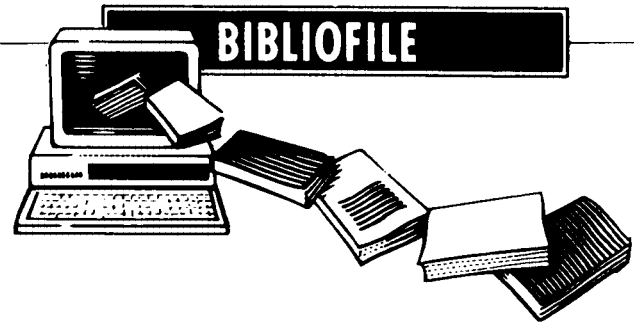
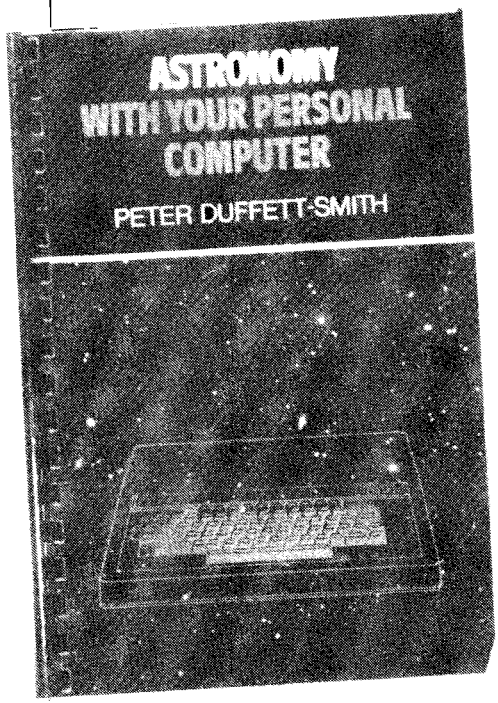


If you're in the mood for gazing at the stars or tackling the intricacies of Unix, this month's book review is for you. David Taylor is your host.



Your stars tonight

As one who has yet to locate Halley's blasted comet (and I gather time's up), I flinched a bit at this.

Do you wish to use your computer for predicting astronomical phenomena, such as the time of moonrise or the circumstances of the next eclipse?

Do the positions of objects in the galaxy such as stars, globular clusters, pulsars or anything else best described using the galactic coordinate system tickle your fancy?

Or what about a quick calculation of the local sidereal times and azimuths of rising and setting celestial bodies given their right ascension and declination as input parameters?

Then again, as the author says of old Halley's Comet, the perihelion epoch and period must first be converted into the mean longitude, L, in the form: $L = A0 + A1 \times T + A2 \times T^2 + A3 \times T^3$

I don't doubt he's absolutely right in this, as in every other brain-curdling aspect of star-gazing with the aid of an ingenious set of linked-up Basic subroutines.

Incidentally, the risk of going boss-eyed finding out for sure may be reduced by sending off for disks (IBM PC, Apple II (with CP/M) and BBC B (80-track)). A corking book for real astronomical enthusiasts, I'd guess, but a closed one for the rest of us.

Title: Astronomy with your Personal Computer
Author: Peter Duffet-Smith
Publisher: Cambridge University Press
Price: $74.00 (hardback); $26.50 (spiral-bound paperback)

Handsome is as handsome DOS

Nothing from the tea-lady, but practically everyone else at Lancaster University's Department of Computing seems to have had a hand in compiling this worthily austere Unix primer, in itself a commendable example of versatile multi-tasking. But whether any of us outside the campus still gives much of a damn whether Unix ever fulfils its never-ending potential is, alas, another matter.

It'll soon be 20 years since Ma Bell started work on Everyman's Operating System, and still we're told that the best is yet to come. For all its linking and portability virtues (real or imagined) Unix remains lumbered by its greed for RAM and lack of bit-mapped graphics in its bid to supersede CP/M and MS-DOS. Mac's icons look far more commercially hot.

The sad fact is that Unix was devised at a time when CPUs were quite scarce and pricey. Today, when micros costing a few hundreds can have a 68000 onboard, one-man-one-micro no longer looks cost-ineffective. Besides, IBMs by the million are scarcely likely to throw in the towel when every DOS update brings the system closer and closer to the Unix Shangri-La.

One way and another, I'd have thought

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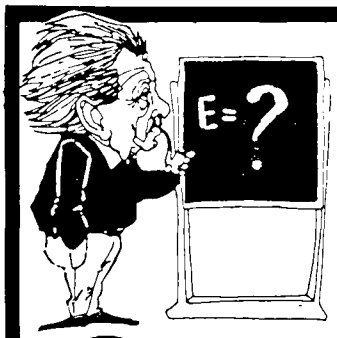

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that if Unix isn't yet quite a dead duck for the micro market, it's looking pretty peaky as time goes by. But the lads from Lancs insist that it is 'extremely popular' and a snap to grasp on any number of machines, so they take us by the hand through the filestore and show how to edit text with 'vi', handle software tools in Unix and format documents with such nattily-named programs as 'nroff'.

Their pay-off is examining the Unix shell. It provides, they maintain, 'a sophisticated and productive programming environment.' I dare say, but it also provides a striking reminder of just how hideously hostile Unix commands now seem in these days of little pictures and mice. Ask an experienced Mac user to try finding a file, not by pointing to it and tapping the button, but by keying into Unix:

```
$ temp=/usr/temp/tempa=dummy
$ echo $(tempa)
dummy
$ echo $(temp)a
/usr/temp/a
$
```

If you and Unix would like to be introduced, this book will make the acquaintance. I just wonder whether you'll want to become firm friends.

Title: A Practical Introduction for Users
Author: RJ Whiddett, RE Berry, GS Blair, RN Hurley, RJ Nicol and SJ Muir
Publisher: Ellis Horwood
Australian Distributor: Jacaranda-Wiley
Price: $60.20 (hardback)
$26.60 (paperback)

Easy PC

The Doctors Lang, no strangers to regular readers of *PCW*, are plainly not ones to mess about with the metamagical or obscure when: (a) countless businesses are still bursting to be told what desk-top computers might do for them; and (b) the huge majority of business PC buyers will plump for IBM and clones.

The hard part is, as usual, to find a tone of voice which does not patronise the commercially astute, yet cannot take it as read that they'll necessarily know a damn thing about PCs. The Langs succeed in so far as this slim paperback is both lucid and digestible at defining likely needs, but they're in danger of skimping in the interests of brevity.

The likely needs they identify are planning and forecasting business accounts with a spreadsheet, presenting results graphically, managing database files, word processing, simple accounting packages and such desk-top helpmates as diaries and calculators, plus the wherewithal to set up occasional comms links to BT Gold and the like.

So far, so fine: tips and pointers, potential pitfalls identified. It's easily-followed, well structured advice. But I might feel a bit short-changed were I to wonder whether my PC could, for instance, whack off a Telex. The Langs explain: 'There are several ways to send messages using your PC. One possibility is to buy a special adaptor, which connects directly to the PC, but these are quite expensive. It is also possible to send telex messages via BT Gold provided you have made special application.'

And that's that. It's true, concise and accurate. On the other hand, it hasn't got you far.

Perhaps the book should be twice as fat, but then perhaps only half as many people might feel up to reading it. All-purpose primers for business computing tyros are, as I say, notoriously difficult to judge, I'd give this one alpha minus.

Title: Managing your business with the IBM PC
Authors: Kathy and Terry Lang
Publisher: Holt, Rinehart and Winston
Australian distributor: Holt Saunders
Price: $25.95

All that's Jazz

Had you watched Wimbledon on American TV last summer, you'd have seen Becker's ball-breaking serves punctuated by slick commercials for Jazz. The ads were there again during *Hill Street Blues* and the *60 Minutes* news programme, and printed versions were plastered in classy magazines such as *Esquire*, *Vanity Fair* and *Fortune*. A cool customer, Lotus was afterwards.

Seven and a half million dollars of smart Madison Avenue money said Jazz was what the Fat Mac was made for, reaching out for the first-time business buyer who might be all kinds of commercially smart, but wouldn't know his DOS from his elbow. The bet was that here could be a kind of Lotus 3-4-5, doing for the Mac what bestselling 1-2-3 did for the IBM PC: providing a soft reason to buy for those who might otherwise be scared off by daunting hardware.

You might wonder whether Macs ever needed that kind of come-hither help, since there never was a matier interface. But if there ever was doubt that a Mac is a fully-fledged business tool, Jazz ought swiftly to dispel it. Jazz isn't just a piece of cake to use — it's a versatile, powerful and snazzily integrated package of word processing, database, worksheet, graphics and communications which excels in all departments. You need 512k and an external disk (preferably hard) to run it, but you won't want for much else once that lot is up and running.

This offical Lotus guide is excellent, step-by-stepping in slickest American fashion through drafting, tracking, analysing, planning and charting your affairs with Jazz. I'd say (and I don't often) that for once it's a useful code to the program's own manuals. I know what it's like to get hooked on Fat Mac Jazz. It's terrific.

Title The Lotus Guide to Jazz in Business
Author: Lotus Books TM
Publisher: Lotus/Addison-Wesley
Price: $39.95 (paperback)

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CHIP CHAT

To: Creative Director, Frisbee Cox Rumore Jimenez Kustra Associates
Re: 1986 Advertising Campaign

RUNNING IT UP THE FLAGPOLE, TO SEE WHO SALUTES

Having received your latest roughs for Australian Personal Computer (Sales) Pty Ltd Autumn poster offensive, I can say that the words 'rough' and 'offensive' are awfully appropriate.

We've had Apple's alligators chomping away at frazzled MDs. We've gaped at Data Generals gee-gee analogy of the PC marketplace. Our braincells have been scrambled by Hewlett-Packard's screen-bounding butterfly and we've grown heartily sick of Charlie Chaplin. But I would not have thought that a 6 metre gaffed salmon, along with the slogan 'Our net really works', is helpful. Nor, come to that, is a montage of the Days of our Lives cast laid end to end with the caption 'Our serial runs longer'.

Look, I know you creative people have it tough, what with the cover charge at Sheila's and the replacement cost of those acre-wide red-framed glasses. And where can you get Gucci at a reasonable price in these straitened times? Nonetheless, I was hoping for something better than fish and foul for our corporate awareness campaign.

What we need is something that will place our name before the public and make some of them place substantial fractions of their taxable income into our palms. Our name, I mean, rather than our zoological or TV-ological proclivities. All they will do is increasse the trade at Greasy Jo's chip shop and boost the ABC's viewing figures.

What we sell — for want of a better word — is computers, and I'm afraid that you can't avoid finding out what the things are supposed to do. Be brave: be the only ad agency which understands what it is trying to con the punter into buying. Produce relevant posters with crisp and accurate information that will tempt prospective customers. In other words, go against the habits of a lifetime.

OK, you will answer, but what about IBM? What indeed. All it has done is sign up Charlie Chaplin in the way that agents signed up Max Walker, and all that has happened is that competitors are using parts of the IBM image to show what they are knocking. (I'm sure parts of Max Walker could — and should — be used the same way, but that's another story.) And IBM has built-in protection, since there is an organisation in Switzerland called Bubbles Inc just waiting to sue the bowler hat off anyone who dresses up some poor sap in Chaplin costume without transferring large sums in gold to a Credit Suisse account.

And what kind of an image is a little tramp for a computer company anyway? No wonder the competition's agencies were sidetracked into Alice in Wonderland, the Beatles singing Yellow Submarine and out-of-work actors depressed enough to be photographed with large fried eggs obscuring their features.

How about: 'Buy a computer, they are really bloody useful.' Or: 'Make your secretary write form letters on a computer and save millions.' Get the picture? Just as dishonest, but with a veneer of reality rather than show business. The market in Australia is not made up of bulging-walleted yuppies, or of up-to-the-leading-edge entrepreneurs looking for 800 machines to make middle management strata more effective in sending reports to each other. The market in Australia — listen carefully — is made up of grasping skinflints who would rather bring back Bob Cratchit on his ledger stool than invest a cent in office equipment.

The customers in Australia will buy business micros only if they can see some new way of chiselling the customers out of a few cents. And they will buy multi-business micros only if that means chiselling multiple customers out of multiple dollars.

Put that on your poster and airbrush it: there might yet be something to salvage from last year's fiasco.

And if you serve me smoked salmon at our next creative meeting, I will make sure that you are exiled to Broadmeadows' backstreets from whence you came.

Yours in hope,
Charles

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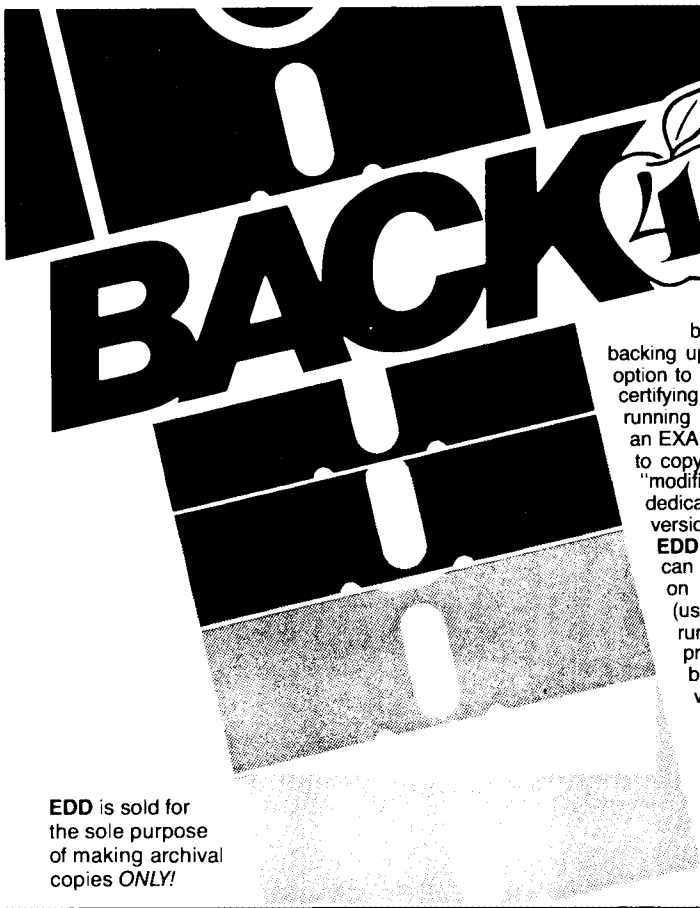

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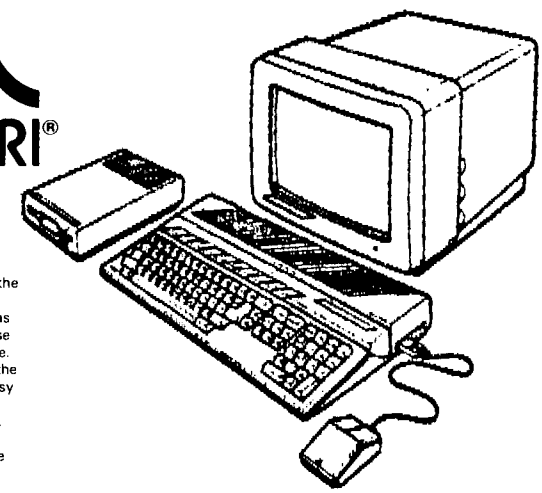

520ST PACKAGE..... FROM **$1995**

Under the dynamic leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), ATARI CORPORATION have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan "Power without Price" has been implemented in the manufacture of the new 512K Atari 520ST Colour Computer which offers the user amazingly high performance at an incredibly low price. Launched as a workstation, this new system incorporates ten software packages as well as the 520ST Computer with 512K RAM mouse controller, 95 key keyboard (with 18 key numeric keypad) MIDI interface, GEM and a 500K 3.5 inch disk drive. With a black and white high resolution (monochrome) monitor (640 x 200), the price is as advertised. Dubbed the "Macbeater" and the "Jackintosh" (after Atari's Chief, Jack Tramiel), Atari's new machine has been compared with the Apple Macintosh which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a powerful alternative to an IBM PC, Apricot or Apple Macintosh. Unlike some of it's overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour will enable software authors to simplify the appearance of screens and will greatly help the user to fully utilise the ST's ability. The power of the ST is harnessed and made user friendly by the new operating system "GEM" from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or b/w graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of the moveable resizeable windows, icons to represent objects such as disks and disk drives; and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM is currently being implemented for the Acorn, ACT, Atari, IBM ICL and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software... Third party ST software packages like VIP Professional turn your ST into a powerful business tool (VIP emulates Lotus 123 and provides an integrated spreadsheet, database and graphics package). Designed with future expansion in mind, the ST also features a host of different intefaces to the outside world and an impressive list of accessories is planned. Atari have a 1000K (1MB) 3.5 inch disk drive available and a 20MB hard disk storage system. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. There are also several other types of peripherals in the pipeline. So, dollar for dollar, feature for feature, the Atari 520ST truly offers the use of POWER WITHOUT THE PRICE.

PRINTER DISPLAY Epson will have special instore display Thursday to noon Saturday at Stones Corner store... featuring Epson GX 80 normally $549 now $399 while stocks last.

SPEAK TO THE COMPUTER EXPERTS... At selected times until Noon this Saturday you can speak to these experts in store at Stones Corner.

● Bordan Tkachuk, National Sales Manager, Atari Computers... for advice on Atari ● Charles Hatchman, Queensland Dealer Manager, Epson Printers... for advice on your printer needs ● Mike Bond, Marketing Director, Business Scope Australia... for advice on any software requirements ● Michael Wagner, Stragegy Software... for advice and demonstration of the OPEN ACCESS and ASSET accounting software ● Bill Brown, Queensland Manager, President Computers... for advice on anything President ● Mark Marooth, For business systems programming ● Plus representatives from Commodore and Sanyo Computers.

Please rush me details of the ATARI 520ST

NAME .....

ADDRESS .....

..... POSTCODE .....

It probably won't show up on the printed page (according to our production manager) but this picture provided to us is not what it seems. It is supposed to be showing Hypertec's Geoff O'Reilly (left) handing over a symbolic Hyperam multifunction board to Arcom Pacific's Ron Chernich ("symbolic" because Arcom Pacific has just signed an agreement to distribute Hypertec's Hyperam board).

But it would seem something went amiss at the signing of the treaty in that somebody forgot to bring the all-important Hyperam board. The box shown in the picture has been inexpertly 'cut in' by an artist well after the event.

So, what was Geoff really giving Ron? We certainly don't know, but there's a free subscription to any reader who comes up with the right answer.

Address your correspondence to Martin Lack at Arcom Pacific, 252 Abbotsford Road, Mayne, 4006.

No rude entries, please.

Order your rubber gloves now: not many people — not even Michael Caine — know that the US market for biometric identification systems is worth more than $2 billion per year and is expected to triple in size by 1995. And even fewer people know that this dramatic growth in new methods of fingerprint, hand-geometry and rectal pattern recognition is being fuelled by fears of AIDS.

Yes, according to International Resource Development Inc, the paranoia about touching door handles that an AIDS carrier or sufferer may once have thought about touching is increasing.

'Sales of surgical gloves are skyrocketing because people are terrified of getting AIDS,' says IRD staffer Jean Buffham from within her sterile bubble. 'Given this mentality, a lot of people can also be expected to resist using access control mechanisms such as fingerprint identification devices.'

So what can we do about handle-phobia, apart from opening all doors with a hanky over our hands and walking on tissue paper like Howard Hughes on a bad day?

The answer, says Buffham, is to let the responsible manufacturers of security systems produce better and better ways of keeping track of who you are, and where you are going and coming from.

For the manufacturers, naturally, are honourable men who would not even consider trading on ludicrous paranoia to sell their goods.

. . . but meanwhile: Molesworth Associates of Green Valley, Arizona (surely some mistake?) writes to tell us of a new electronic device which can scan your fingerprints, and, in a few seconds, reproduce them on an FBI-compatible record card.

'No more messy ink pads, no more stained fingers, no more distortions from too much prerssure or too much ink,' crows Molesworth on behalf of Fingermatrix Inc. And Fingermatrix president Michael Schiller tells us that one major benefit of the new system is in producing 'high-quality fingerprinting records of children.' In a few seconds, he says, parents can have a permanent record of each child's 10 fingerprints on a single card, for use in identification should the child go missing — and, presumably, be found in a condition precluding any other kind of identification.

Leaving aside questions about Mr Schiller's positive outlook on life, one would hope that the FBI's records on the childrern of the US are complete enough to eliminate subversion and AIDS carriers among the under-10s.

But you'd better be sure to wear surgical gloves around Green Valley, Az.

END

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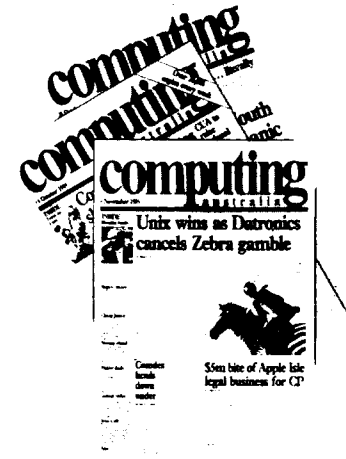

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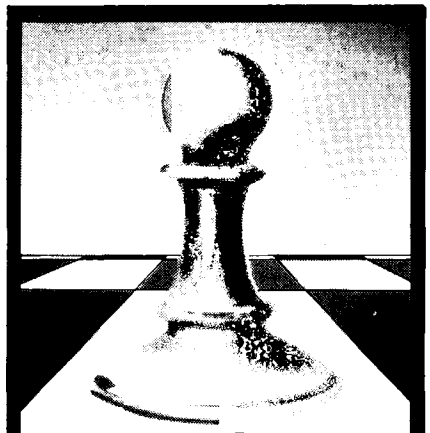

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Computer aided design is no longer the privilege of large architectural and engineering firms, who could afford such programs as well as the systems needed to run them. TurboCad is a high performance design package meeting accuracy and standards required by professionals. Written in Turbo Pascal, this fast, versatile package develops learning curves for new CAD users, comparable to those associated with simple word processors and spreadsheet programs. You don't need a degree to benefit from TurboCad, in fact our happiest customers include set designers, floor planners, interior decorators, merchandisers, architects, engineers and land surveyors – only some have degrees.

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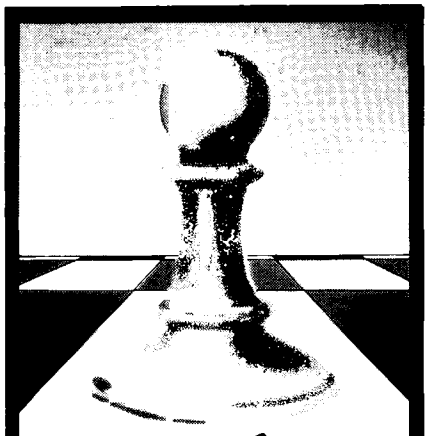

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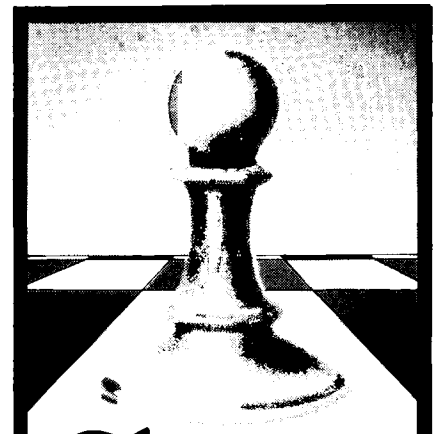

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